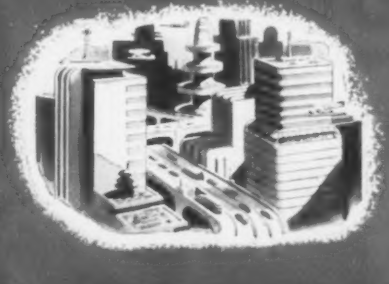
Vol. XIV, No. 9 MARCH, 1945

THE TOOL ENGINEER

OFFICIAL PUBLICATION OF THE ASTE AMERICAN SOCIETY OF TOOL ENGINEERS



Machine Tools and Tool Engineering are the Keystone to Mass Production of War Matériel

THE March number of THE TOOL ENGINEER is being issued without advertising pending the disposition of an application for an additional paper allowance beyond the amount necessary to publish THE TOOL ENGINEER in the form presented in this issue.

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Pioneers of Mass Production

Number Two of a Series

HISTORIANS generally agree that Eli Whitney is the father of modern mass production. This fact, however, has been well overlooked by most school books. It was not an intentional snub. It was simply because Eli Whitney invented a machine which revolutionized the cotton industry in the South and added untold millions of profits to the southern planters and to wealth of the country. This invention, of course, was the cotton gin.

Less spectacular, but even more significant, was Eli Whitney's standardization of parts, which he introduced in 1798 in connection with his plan to mass produce firearms.

Up to this time a gun was individually produced with all parts specially made and fitted for it. Innumerable gunsmiths were employed in the making of firearms. Production was thus naturally slow as well as limited. Also, it was not possible to use parts from one musket to repair another.

Through his good friend Thomas Jefferson, Eli Whitney obtained a contract from the Government for making 10,000 muskets. Before he could proceed with the manufacture of the muskets, it was necessary to change the design to favor production purposes. The process was not easy or inexpensive. The way of a pioneer is generally always hard, and Eli Whitney experienced many heartaches before the muskets were placed into production.

Because his progress was slow and doubts began to arise in Washington as to his ability to produce the muskets, Whitney decided on a dramatic course. He packed up ten of each of the individual parts going into a musket and placed them in separate piles on a table before a large body of military and gun experts. He asked each of the men assembled to pick at random from each pile a part and place them before him. With lightning speed Whitney picked up the parts from each pile and quickly assembled ten muskets, one out of the parts in each pile.

Although the demonstration was not given the important place in industrial history that it deserved, since it was the first demonstration of the assembly of a product with interchangeable parts, it brought Whitney the added time he needed to complete his contract.

Whitney hit on a basic system of mass producing which, in its prime essentially, is in use in the mass manufacturing of every product from a fountain pen to an automobile.

While it is possible that some other inventor might have invented the mass production technique, it can be said of Eli Whitney that he greatly hastened the industrial development, and thereby the greatness of our country with his system for manufacturing muskets in 1798.

PUBLISHED MONTHLY BY

THE TOOL ENGINEER

AMERICAN SOCIETY OF TOOL ENGINEERS

VOLUME XIV MARCH, 1945 NUMBER

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The ASTE Year in Review

THIS, the March, 1945 issue of *The Tool Engineer,* is published in a different form, and reference to that novelty is made elsewhere. It is, nevertheless, your *Tool Engineer,* and through these pages opportunity is given me to talk with you once more.

This year's accomplishment has been the objective of the Society during all the preceding years, with its conclusion it becomes merely a record of preliminary work.

Who said "All that is past is prologue," and who first said 'The King is dead—long live the King"? I do not know, but it is certain that both expressions apply to the Society.

It is vibrant, dynamic, and is growing in thinking, in stature, and in importance.

This administration has been concerned with fulfilling the basic aim of the Society, continuing its regular services, and executing as completely as possible the special assignments carried over from previous administrations. Incidentally, this issue is the best tangible evidence of the importance the Society attaches to the technical and educational phases of its activities. If these were not actually and constitutionally essential, the Society and its publication would not exist.

In February 1944 we had 15,582 members. Today, virtually 18,000—an increase of 15%.

During the year charters have been issued for chapters at Richmond, Indiana; St. Catherines, Ontario; Phoenix, Arizona; Flint, Michigan; Pontiac, Michigan, and Muncie, Indiana, making a Society of seventy chapters.

In addition to uninterrupted professional service devoted almost exclusively to the prosecution of the war, 527 members have joined the Armed Forces, during the past year, giving us a total representation there of 1,167 members.

The Society has begun its reorganization as recommended by the Organization Progress Committee. It has assumed in full the details of management of *The Tool Engineer.* It has also inaugurated the compilation of *The Tool Engineers' Handbook* and, in addition, the work of the Education Committee is beginning to produce tangible and lasting results in the field of education.

As President of the Society, I regret that the new administration will be bothered with unfinished business, but all members of the new Executive Committee know that they have the complete support and unselfish and sincere will of all of the retiring group to help in any way.

This Society has done much in thirteen years. I am proud of what has been accomplished this past year. Most of all, I am proud of the Society itself, and grateful for the association and experience it has brought me. I am not unmindful of the time and energy demanded by participation in Society activity, but I can honestly say that my biggest regret is that there was not more time or energy available.

My family and my employer have permitted me to devote much attention to the Society which otherwise would have been devoted to their interests, and my gratitude to both is now publicly expressed.

An honor accorded few men has been enjoyed by me for the past year, but above the honor of the Presidency, I value the association, cooperation, and just plain work of my associates, most of whom have contributed time, interest and energy far greater than mine. Without exception, they have held the reputation of the Society inviolate and have worked, and worked hard and unselfishly. To name all would be impractical, so I shall name none, but from past presidents to future presidents, their official families, staffs and members, I extend felicitations, and to the new organization, God Speed.

D. D. Burnside, *President*
1944-45

By Andrew E. Rylander

Hydraulic Systems Applied to

The trend to Hydraulics, started several years ago, is progressing at an accelerating pace. In combination with electrical controls, hydraulic appliances and hydraulically operated machines promise to entirely supersede purely mechanical tools and equipment in many lines of manufacture. All this despite the fact that, while long since an exact science based on immutable laws, hydraulics is still in an early stage of development.

With applications infinite, however, it is not the purpose, here, to deal with specific conclusions—as all-out designs of hydraulic machines—but to suggest ways in which hydraulics may be applied to current and future machine design. In this connection, the circuits and diagrams shown are through the courtesy of Vickers, Incorporated, and the incidental units—control panels, valves, pumps and fluid motors—are Vickers equipment. All have been "through the mill"—i.e. the illustrations are of applications entirely practical and proven adequate through long and successful use.

HYDRAULICS, or fluid in motion, is essentially a natural phenomenon that, like fire, was diverted to human use long before the dawn of recorded history. The water wheel, for example, was known to the ancients and, within the memory of living man, was a common source of power in the United States. Latterly—and especially for the generation of hydro-electric power—the water wheel has been superseded by the hydro-turbine.

Here, however, we have power generated by weight, or fall, not by pressures. It is only within the past few decades that fluid under pressures up to the thousands of pounds per square inch, generated by pumps or other compressors, has been brought under such nicety of control that it can be used to transmit as well as to generate power. Actually, the precision control of intricate motions, and of precisely synchronized machine cycles, is a strictly modern development.

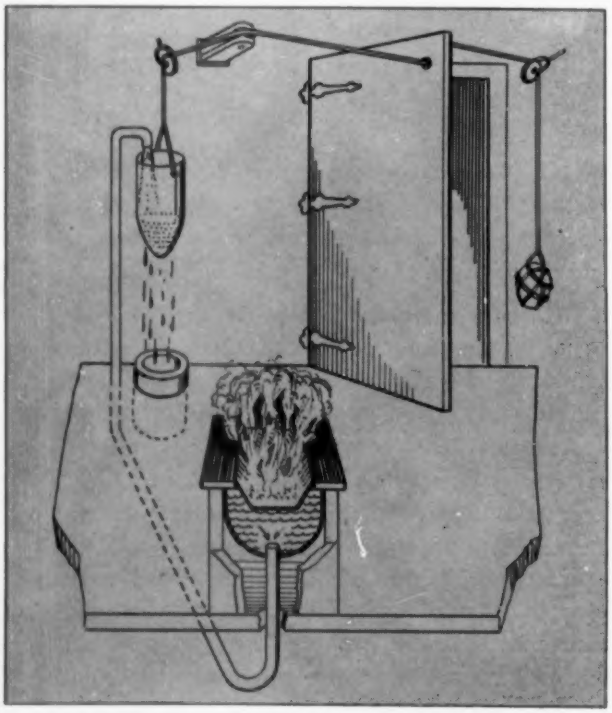


Fig. 1. Hydraulic door-opener used in ancient temples.

Fluid under pressure, however, was crudely applied in ancient times. Fig. 1 shows an early yet ingenius device for opening and closing doors in ancient temples. A boiler was concealed under the altar fire, and as the water heated and generated steam, the resultant pressure would force the water through a duct leading to a suspended bucket. As the latter filled with water, its weight would pull the door open. The bucket would then be emptied through holes in its bottom, when the counterweight would pull the door shut. This principle is applied in modern steam traps; in olden times, however, it was sheer magic as far as the lay worshipper was concerned.

Strictly speaking, however, this device employed weights to do its work, not pressure *per se*. On the other hand, an early pipe organ—the Hydraulis, (Fig. 2) popular in Roman times—used hydraulic pressure to do its work. To insure a

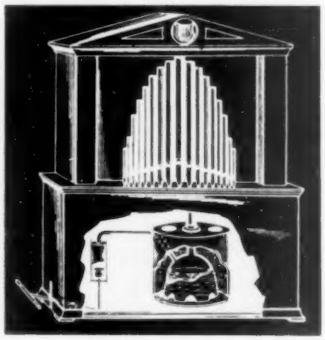
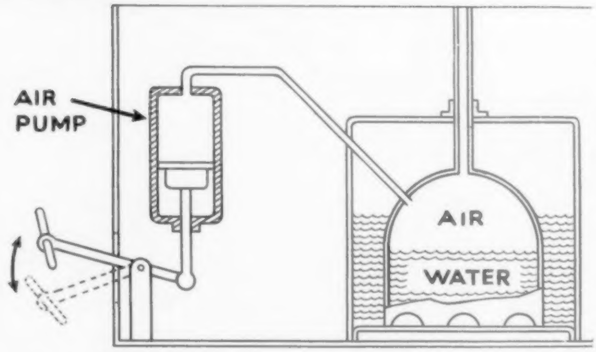


Fig. 2. Roman pipe organ utilizing hydraulic principles to equalize air pressure from hand-operated pump. Enlarged diagram is shown below.



steady flow of air, rather than the unstable puffs incidental to hand pumping, air was pumped into an inverted bell submerged in a tank of water. The water being free to rise and fall, the air pressure remained fairly constant. As a modern analogy, one can cite the gasometer, where the upper inverted section of the huge tank rises and falls on its water seal and maintains an even pressure.

The science of hydraulics descended to a nadir during the dark ages, and almost by-passed the Renaissance. During the late 16th century, however, the Italian Ramelli recorded several hydraulic devices by largely unknown inventors, the most of which were tricky contraptions and of doubtful use except as museum pieces. Of a more practical turn, however, the rotary, water wheel driven drum pump shown in Fig. 3

Machine Design

A simple outline of the principles and development of hydraulic pressure systems, and some modern applications.

shows modern features. Here, pressure was effected by means of sliding vanes, the only obstacle to efficient performance being inaccurate machining with the crude tools at hand.

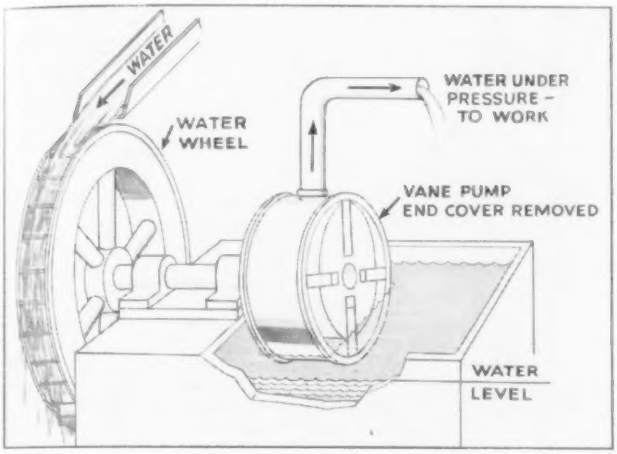


Fig. 3. 16th century rotary water wheel driven drum pump.

While the basic principles of various modern methods of moving liquids under pressure, and of converting motion and pressure into work, were tried out in the middle ages, it wasn't until the 17th and 18th centuries that fluid under high pressure became a fact. Actually, high pressure hydraulics had its genesis in 1658, when the French scientist Blaise Pascal promulgated a law of physics, viz: that fluid under pressure exerts that pressure equally in all directions. As, for example, if one fills a tank with liquid, and then exerts 1 lb. pressure with a piston having an area of 1 sq. inch, the resultant pressure in all directions would be 1 lb. per sq. inch. Pressure hydraulics is based on the Pascal law.

This law led to the use of cylinders of unequal size to lift great weights. Fig. 4, for example, shows a piston of

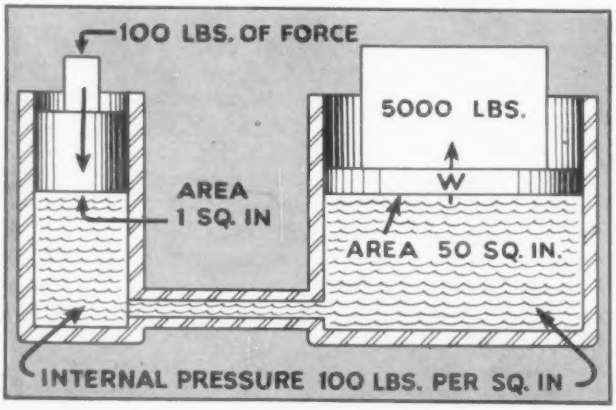


Fig. 4. Early use of hydraulic pressure to multiply power.

1 sq. inch area exerting a pressure of 100 p.s.i.; the fluid, in turn, exerts identical pressure on a piston having an area of 50 sq. inches. As a result, the power is multiplied fifty-fold, enabling the larger piston to raise a weight of 5000 lbs. Naturally, the lift is decreased, being only 1/50th the travel of the 1" piston. This principle is applied to modern squeeze riveting systems, where initial low pressure—usually about 1000 p.s.i.—is boosted to 5000 or more at final squeeze.

Over a century passed before Pascal's law was put to practical use. Then, late in the 18th century, an English mechanic named Joseph Bramah invented and patented a hydraulic press—Fig. 5—based on the Pascal law. Here, a hand operated force pump, with small piston area, was used to build up pressure under the larger, ascending ram. Pressure on the up stroke was checked by a gate valve, manually opened on the down stroke, when the fluid—presumably water—was wasted. A flap valve, between the small cylinder and the supply, opened and closed with the action of the piston; another, between the two cylinders, checked back pressure. Except for modern refinements, this principle is used today in at least one portable, manually operated high pressure hydraulic riveter.

While it is a far cry from the crude Bramah press to the simple, yet highly refined modern circuit shown in Fig. 6,

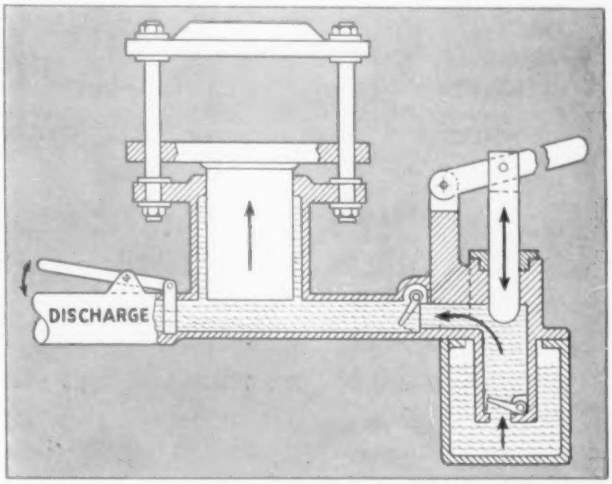
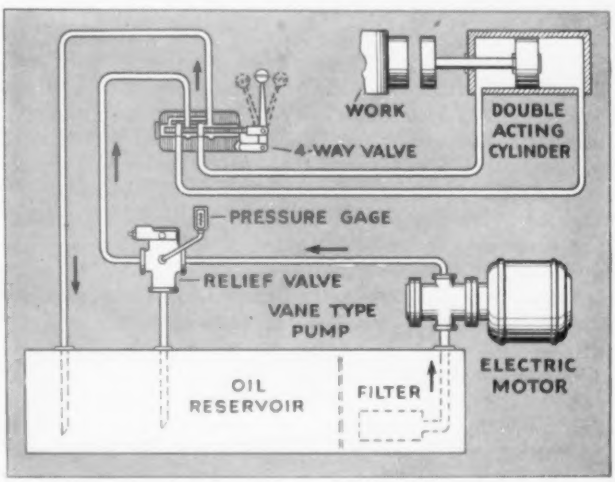


Fig. 5. Late 18th century Bramah press based on Pascal law.

the principles of operation are largely similar. But where pressure in the Bramah press was built up by toilsome labor, and varied in direct ratio to the energy of the pumper, the modern system employs a constant torque, constant speed motor to actuate the pump. And where efficiency of the first

Fig. 6. Modern power-driven development from Bramah press.



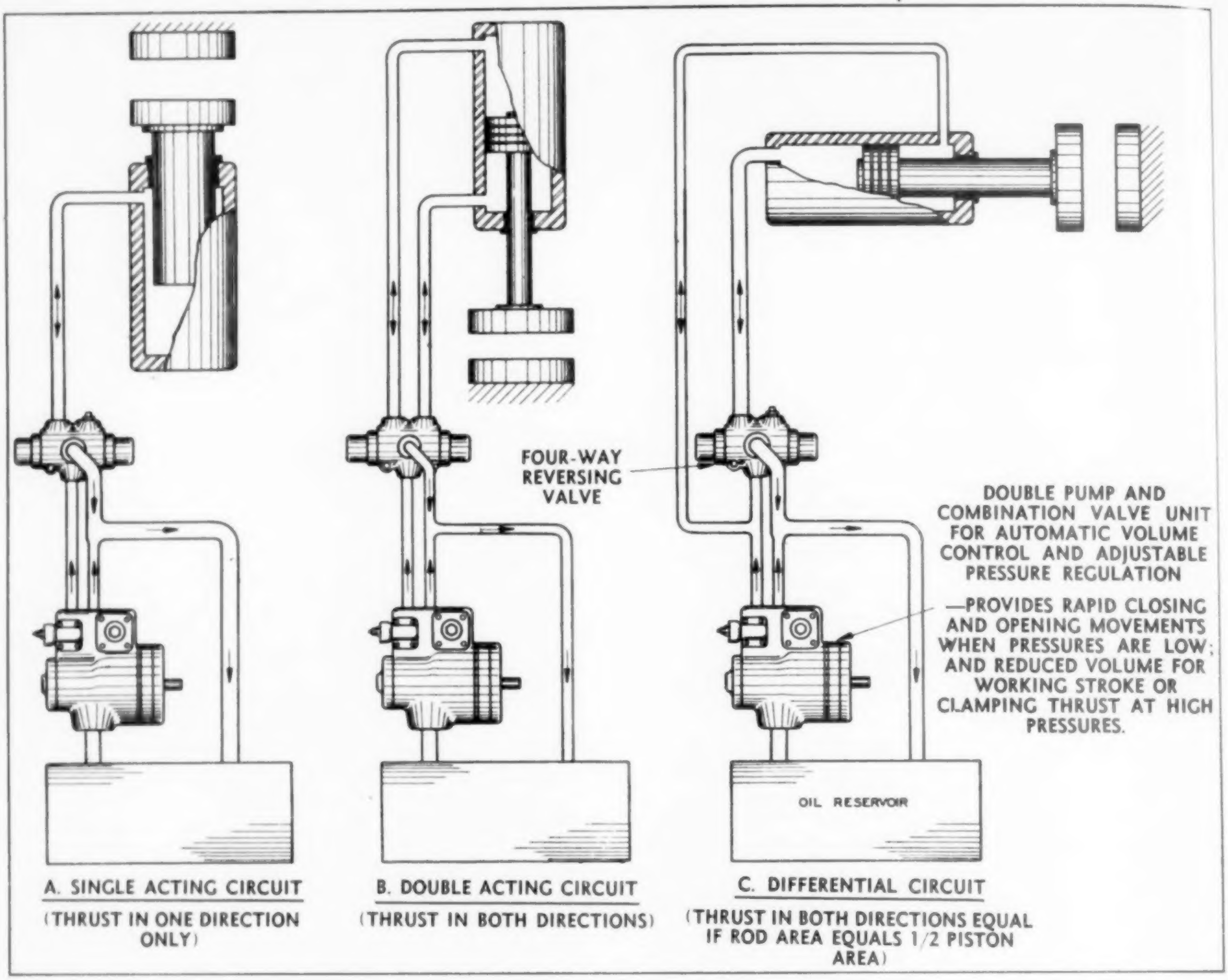


Fig. 7. **Examples of simple press or clamp installations of modern types.**

was considerably impaired by loose fits and leaky valves, the modern system is super-efficient and machined to close limits of tolerance.

In the modern system shown, pressure can be adjusted and directly read on a gage, and once established, may be maintained by the relief valve, which diverts excess fluid to the supply tank and maintains an even pressure to and through the 4 way valves to the cylinder. In this connection, the cylinder in Fig. 6 may be used in horizontal position, as shown for clamping work or for hydraulic piercing. If vertical, we have a simple hydraulic press.

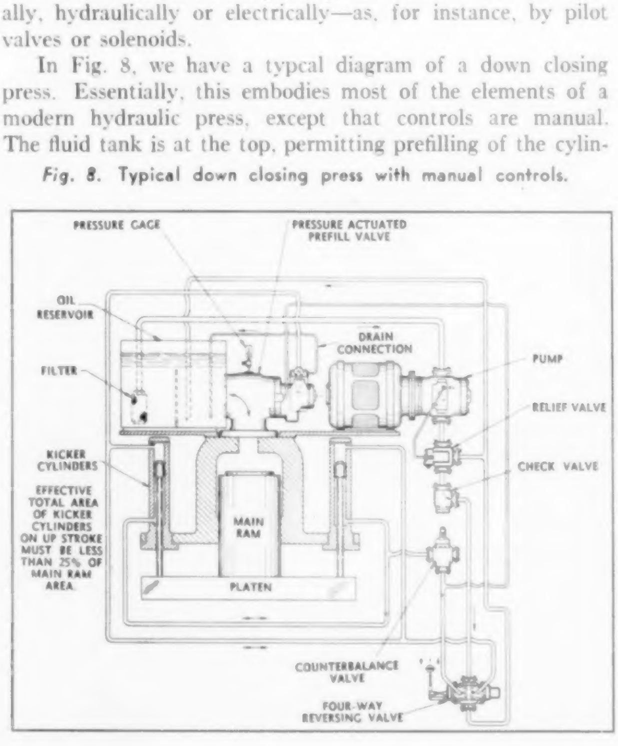
Modern Presses or Clamps

Typical examples of simple press or clamp installations are shown in Fig. 7. "A" shows a single acting cylinder, with its incidental circuit, with thrust in one direction only. Here, barring some mechanical device for shutting the cylinder, the thrust must be upward, the ram descending by gravity once the pressure is released. "B" shows a double acting circuit with pressure on both the working and return strokes. Naturally, the lesser thrust is on the up stroke, due to the reduction in area created by the piston rod. "C" shows a differential circuit, where thrust in both directions is equal provided that rod area equals one half of the piston area and that pressures, head end and rod end, are correspondingly stepped.

A double pump and combination valve unit is used for automatic volume control and adjustable pressure regulation. This provides rapid closing and opening movement when pressures are low, and reduced volume for working stroke or thrust at high pressure. Conventional 4 way valves are shown; however, these may be operated manually, mechanically, hydraulically or electrically—as, for instance, by pilot valves or solenoids.

In Fig. 8, we have a typcal diagram of a down closing press. Essentially, this embodies most of the elements of a modern hydraulic press, except that controls are manual. The fluid tank is at the top, permitting prefilling of the cylin-

Fig. 8. **Typical down closing press with manual controls.**



through the prefill valve immediately over the cylinder port. Return stroke is effected by the two kicker cylinders, the effective area of which, in the up stroke, must be than 25 per cent of the main ram area.

Tracing the circuit, it will be seen that the fluid passes ugh a relief valve (with by-pass, back to the tank, connected to the return line) thence through a check valve to the port of the 4 way reversing valve. On the down stroke, ssure is exerted simultaneously on the main and kicker ms. On the return stroke, the fluid in the main cylinder urns unrestricted to the supply tank, leaving the main linder prefilled for the next down or working stroke.

Push Button Controls

To this system, but not shown, may be added a push button control panel, for start, stop, automatic and semi-automatic operation, and provision for "inching" the ram up and down. There may also be added pilot operated, solenoid controlled 4 way reversible valves, a variable delivery piston type pump, and work clamping or knock-out cylinders in addition to the kicker cylinders when, with other modern refinements and appliances, we would have the powerful, quick operating, hydraulic press which has all the desirable features of the mechanical press plus a control of speed of stroke entirely at the discretion of the operator or to suit a specified condition.

Progressing from the simpler to more involved rectilinear motions, the circuit diagram of an injection molding machine,

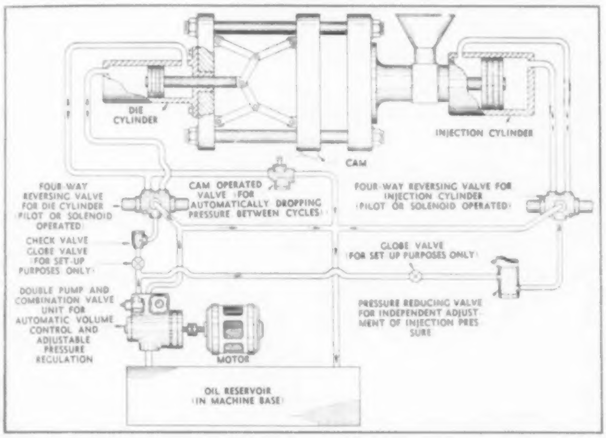


Fig. 9. Circuit diagram of injection molding machine.

Fig. 9, should be of particular interest in view of the growing trend to plastics and powdered metallurgy. Here, a toggle is interposed, between the thrust cylinder and the ram, to impart additional squeeze to the compound to be molded; besides, the straightening arms of the toggle tend to decelerate the forward action of the ram at final closing. The ram, in turn, actuates a cam operated valve on its return stroke, which automatically lowers the pressure between cycles. However, the circuit diagram is self explanatory, the whole conveying an excellent idea of the essential elements of hydraulically operated injection molding machines.

Reciprocating Table Motion

While still on the subject of rectilinear motion at least one diagram applicable to reciprocating table motion is in order. There are diverse variations to the circuits and incidental hydraulic units used for machine table traverse, ranging from manual control (through conventional 4 way valves) to fully automatic. The diagram, Fig. 10, applies to a fully automatic reciprocating cycle. While the diagram is largely self explanatory, one item may prove somewhat confusing to the uninitiated.

Looking head on at the rotary pilot valve, which the

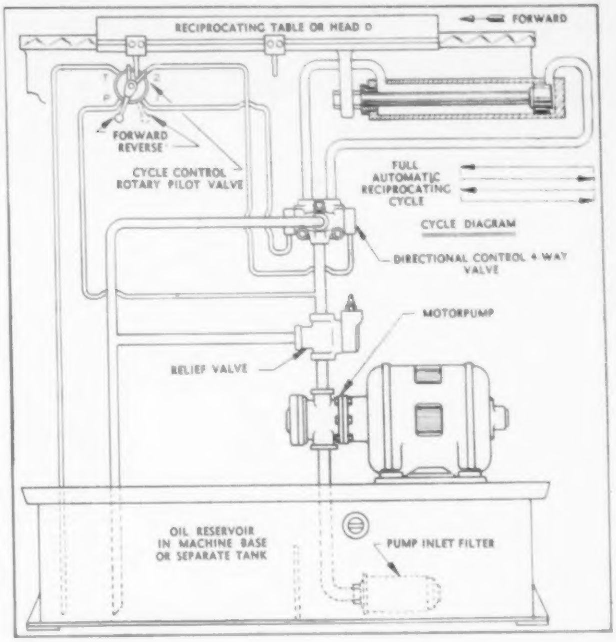


Fig. 10. Fully automatic reciprocating cycle.

rearward trip dog has just thrown into forward position, it may seem that the dog will immediately reverse the valve on the forward travel of the table. However, the fingers on the valve are staggered, so that only one dog can engage or trip its related finger. On the whole, this diagram is typical of any hydraulic table traverse.

So far, we have concerned ourselves mainly with straight line motions—i.e., with direct thrusts and incidental reverses. We now take up rotary and compound motions, starting, however, with the simpler elements. Later, these will be reconciled with the more complex circuits and the various units incidental to hydraulically operated automatic machines.

In this connection, hydraulics is included among the prime movers in that, either as a result of fall or pressure, it receives and modifies force or motion. However, pressure must be built up by means of some extraneous force, as by an engine or electric motor operated pump. Because most modern hydraulically operated machines are self contained, the electric motor is the preferred and commonly used medium.

Many Combinations Possible

Once there is pressure, however, one may apply it to motion, either reciprocating or rotary, or to both, and the number of units that may be operated, from one source of supply, will depend entirely on capacity (volume in gallons per minute) and pressure. The various units, in turn, may be simultaneously or intermittently—and independently—operated, with desired pauses, dwells or arrested motions, by means of properly disposed control valves. Thus, a machine may be designed to include fluid motors, a reciprocating table moving to and fro and laterally, movement of a fixture with one or more hydraulically operated clamps, together with indexing mechanisms and preloading facilities, and so on ad infinitum.

In combination with electronic controls or "mechanical brains," one can make these motions individually or severally automatic. As an example of a mechanical brain—and verbal description will suffice—one may mount cams on one or several rotating discs or drums, the latter in turn mounted on a shaft the speed of which must be constant and, preferably, driven by a constant speed electric motor through a reduction gear or variable speed transmission. While there

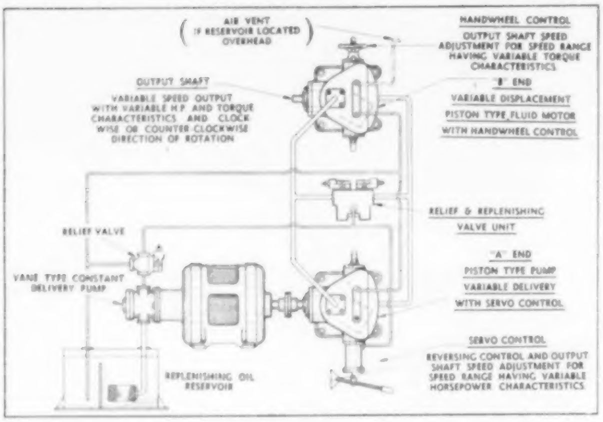


Fig. 11. Hydraulic circuit for variable speed and power.

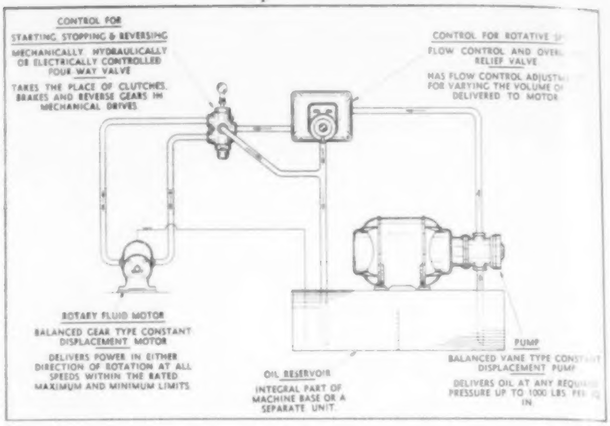


Fig. 12. Comparison of hydraulic and electric circuits.

may be some slight fluctuation in speed, as load is applied, the timing cycle will be consistent between the various units. The cams may be used to directly depress spring operated 4 way valves, or to actuate these through pilot valves, or, by means of contact switches, through solenoids. Sometimes all may be used.

Here, a word of caution regarding pump capacity. One may design a machine in which all of the units—cylinders and motors—may require but nominal volume, as, for example, 100 gallons per minute. If the cycle is such that the units operate recurrently—i.e., in sequence—with an interval between each motion, then the 100 g.p.m. capacity may suffice. It is, however, well to provide extra capacity, more or less as one includes a factor of safety in mechanical appliances.

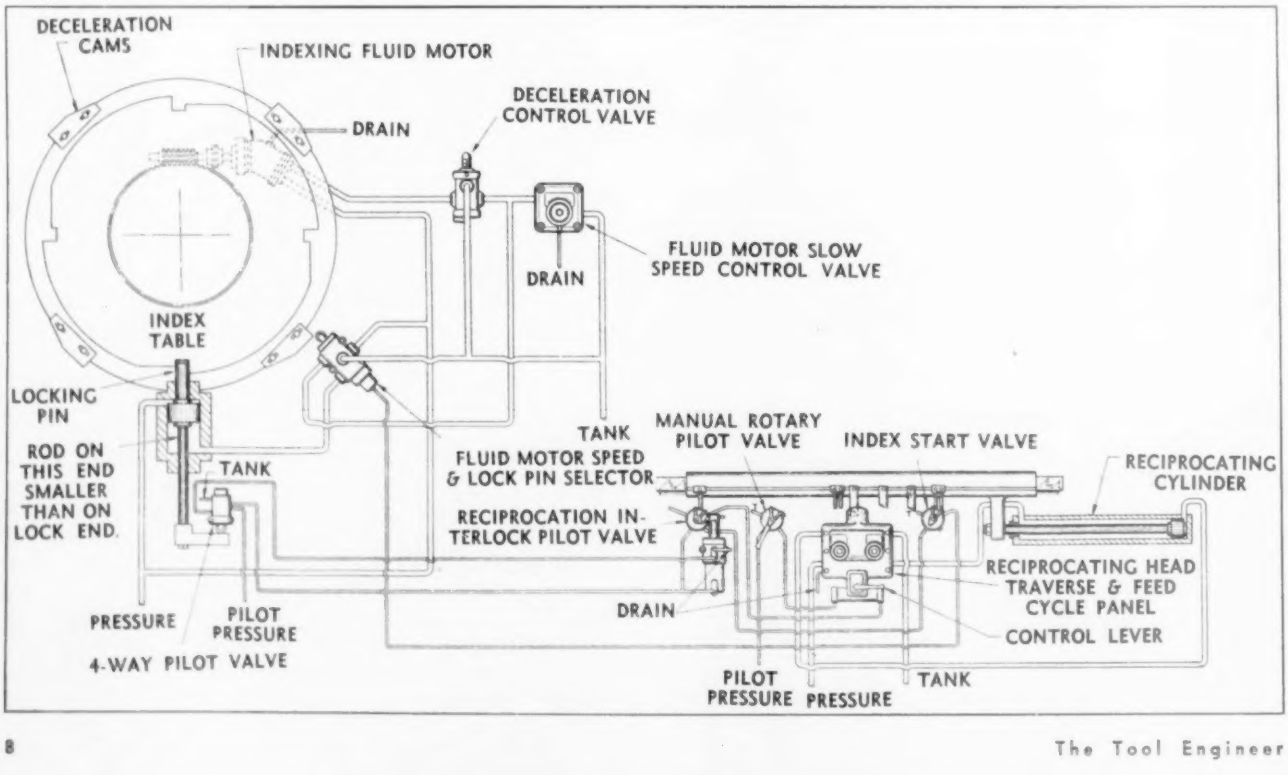
Ample Capacity Needed

If, on the contrary, there is concurrent motion, or overlapping of functions, then extra capacity must be provided to coincide with the maximum volume required in any one time interval. As an example, a hydraulic motor may require 10 g.p.m. for its operation, and this would be constant, leaving 90 g.p.m. for other work. Now assuming a 10 second total cycle, in which a number of cylinders would operate, the volume delivered for that period would only be 9 gallons, (or .9 gallons per second) to be distributed among all the remaining units. Obviously, then, the volume must equal, and preferably exceed, the maximum requirement for any given time interval. As a safe rule, provide volume in excess of the maximum requirement *for each second*, rather than for each minute, of operation.

Fig. 11 shows a simple hydraulic circuit for a variable horsepower type variable speed rotary drive. That is, fluid under pressure, generated by a motor driven pump, is used to operate a fluid motor. Comparing this to an electric circuit, we would have a motor-generator set (in this case, the electric motor and hydraulic pump) with its relays and switches, for transforming AC to DC current and supplying the latter to a DC motor. There is, however, an advantage over the electric motor in that the fluid motor, running in oil, may be started, stopped, reversed or stalled repeatedly without damage.

The diagram, Fig. 12, may also be compared to an electric circuit—or, going a step farther, to the differential system used in automatic welding heads, where feed of the electrode is accurately governed by combined AC and DC motors. As in Fig. 11 we have the motor-generator set, but

Fig. 13. Hydraulic indexing system with fluid motor and table traverse.



with the current (fluid) supplied to a variable speed motor.

Actually, this circuit applies to a variable speed hydraulic drive in which the power is supplied by a variable delivery piston type pump in unit with reversing control and output shaft speed adjustment. A vane type, constant delivery pump is coupled to the opposite end of the electric motor, and insures a constant flow of fluid for control of valves. The motor is a variable displacement piston type, with hand-wheel control, the whole combining into a highly efficient speed transmission having all the advantages of either mechanical or electrical drives plus the smoother action of fluid power.

Combination Units and Circuits

Now, combining a number of the hydraulic units and circuits previously discussed, we present a diagram (Fig. 13) of a hydraulic indexing system, with properly disposed fluid motor and table traverse. This system is for automatic repeating index and work cycle, the whole suggestive of automatic machine design. Table index is effected by a fluid motor through a worm drive. At start of index, the differential lock pin (piston) is retracted, when the fluid motor starts rotation. Deceleration cams, depressing a valve or limit switch (whichever is used) which controls both the lock pin and fluid motor, slow up the table just before completion of the index cycle. Then coincidental with the engagement of the lock pin, the valve (or switch) roller drops off the cam, instantly stopping the rotation of the table. Here, the worm drive, and the incidental deceleration, prevents over-run.

Hydraulic "World of Tomorrow"

Also, at the instant of locking, a finger on the rod end of the locking pin (piston) depresses the work cycle to index interlock, holding the locking pin securely until the next index cycle. There are many variations to the diagram shown, since hydraulic units—as motors, cylinders, etc.—may be applied in an infinite number of ways as suits the discretion of the designer or for applications suited to a specific job.

As stated in the introduction, the diagrams and descriptions shown above are mainly suggestive. Nevertheless, they are authentic and factual—in nowise purely theoretical—and may be followed as practical guides to the application of hydraulic force to an infinite variety of tools, fixtures, simple and compound motions, and to manually controlled, semi-automatic and fully automatic machine tools. To a great extent, the world of tomorrow will be moved by hydraulic power. "Fluid drive" is here to stay.

By A. M. Slusher

Carbide Tooling Boosts Production

Vital aircraft instrument parts produced faster and more accurately than by grinding.

IN THE Saga of Mass Production, carbide tools have played a stellar role since America's entry into World War II. In the manufacture of aircraft parts, for example, carbide tooling has boosted production severalfold over the rate possible with high speed steel tools. This holds true, especially, in the plants of Bendix Aviation Corporation, where production and quality alike have been greatly enhanced because of Carbide Tooling.

***Albert M. Slusher*, a member of Philadelphia Chapter, ASTE, spent several years with the Corning Glass Works, the Naval Aircraft Factory at Philadelphia Navy Yard, and the Baldwin Locomotive Works Southwark Division, before joining the Bendix Aviation Corp. Philadelphia plant in 1941. For the past year he has specialized in carbide tooling.**

The Bendix Aviation Philadelphia Plant, for instance, has frequently superseded grinding with faster carbide tooling methods. Until recently, many of these jobs were considered impractical by other means than grinding. Through new techniques, however, vital instrument parts are now being turned out in volume, with carbide tools, and to a standard of quality easily comparable to that produced by grinding.

Fig. 1. Planetary spider.

One important Bendix contribution to the tooling field is the method applied in machining the studs of Planetary Spiders of S.A.E. 4350 forged steel (Fig. 1), which has previously been rough machined and heat-treated to a hardness of 46/48 Rockwell "C". The diameter of the studs is held to a tolerance of plus three ten-thousandths (.0003) minus nothing, and the diameter on which the three studs are located is held to a tolerance of plus or minus one-thousandth (.001) full indicator reading. The height of the pad at the bottom of the stud is held to plus or minus .001.

This operation was formerly done on internal grinders, with four of the machines running continuously in order to produce the required number of parts per month. Under the new set-up we produce the same number of parts on one machine with several days to spare.

Precision Boring Set-up

The machine is an Excello Precision Boring machine, Model 1212—shown in plan view, Fig. 2—with a 1 H.P. motor turning at 1150 R.P.M. and driving the spindle at 2800 R.P.M. which produces a surface speed of 288 feet per minute. The stock removal is .030 on the diameter and .015

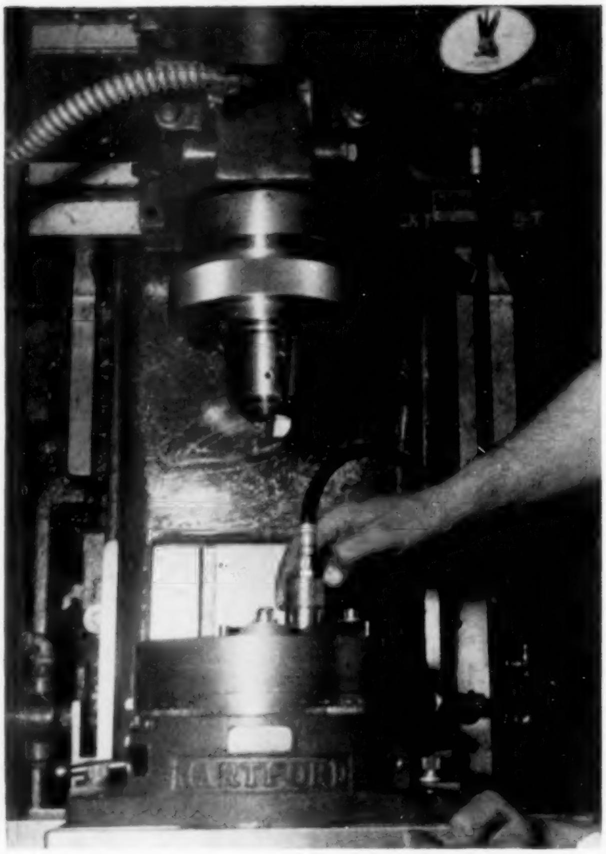


Fig. 2. Set-up for machining studs of Planetary spiders. Operator is checking finished part with a Moore Air Gage.

on the face.

The indexing head is a Hartford Super-Spacer, Model "C" which maintains the necessary tolerance of five ten-thousandths on the chordal dimension between the studs.

The fixture and tool carrier (shown in Figure 3) are of comparatively heavy construction, being so designed as to assure absolute rigidity and freedom from vibration and chatter. The clamping arrangement is brought very close to the point of contact of the tool bit. The tool carrier, being heavy and of large diameter, acts as a fly wheel to prevent any hesitation of the power supply when the tool bit strikes the shoulder at the bottom of the stud.

Adjustment of the tool bit is accomplished by two set screws acting on opposite sides of a rocker pin for rough setting and for final size we utilize the eccentric plug in the Excello spindle for micro adjustments.

No Coolant Needed

An outstanding feature is that this operation is run without coolant or oil and there is practically no heat generated in the part or tool bit, although the chip is removed at a dull-red-heat.

The part is gaged on the machine with a Moore Air Gage. This gage gives an accurate check on the extremely close tolerance and also affords the operator with a visual check on tool wear so that adjustments for size can be made before any of the parts are actually out of balance.

The tool bit is a Vascoloy-Ramet Grade "E" ½" square L.H. turning tool.

The result is a part that is consistently within tolerance, the studs being perfectly round and without taper, and of a surface finish that, in appearance and by actual analysis, is superior to the ground finish. The floor to floor time is 2.12 minutes.

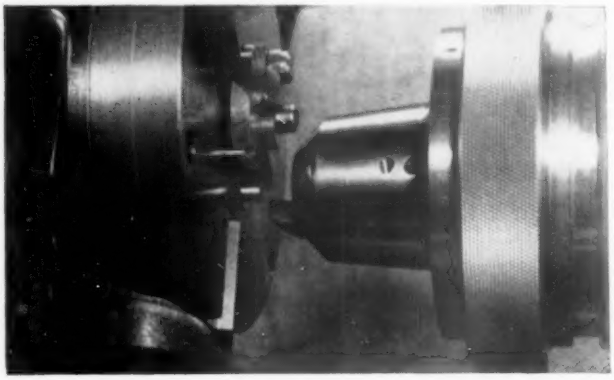


Fig. 3. Fixture and tool carrier for machining planetary spider.

Industrial Metalizing

Entering the salvage and reclamation field, the Industrial Metalizing Company has been established by Walter R. Jackson, formerly with Packard Motor Car Company, and William M. Flashenburg, president of Flash Tool and Engineering Co. The plant will be located at 3845 Grand River, with offices at 6432 Cass Avenue, Detroit. The company will devote itself to salvage and reclamation by the comparatively new but proven technique of metal spraying.

By this process, worn parts—as shafts, quills, machine slides and ways, etc.—are reclaimed by spraying on metal and then refinishing to original dimensions. The result is a homogenous unit which, it is claimed is superior to welding in that no preheating, with its resultant warpage, is necessary. Furthermore, the process is said to be considerably faster than welding, and may be done at the customer's plant, or at the contractor's, as expediency demands.

In addition to salvaging, the company will specialize on protective spraying, as coating wood patterns with aluminum or bronze, as well as spraying non-corrosive metal on parts exposed to the elements or otherwise subject to erosion. Using the finest equipment, under supervision of trained engineers, the Industrial Metalizing Company is said to be the only concern in the Detroit industrial area exclusively devoted to metal spraying.

Reconditioning of Carbide Tools

A New Department, for the Reconditioning of Carbide Tipped Tools, is announced by the National Tool Salvage Company of Detroit. According to L. W. Lang, president of the company, this department has been added to meet industry's demand for such a service.

All types and grades of carbide tipped tools will be reconditioned in the new department, which is staffed by men of long experience and recognized ability in the carbide field. It is separate from the High Speed Steel cutter salvage operations, pioneered by National Tool Salvage 33 years ago.

Back-Off Method for Fluted Cutting Tools

New Grinding Process Greatly Increases Tool Life Between Grinds

By Rex Heath

WHILE various methods of back-off—many perhaps overlapping—are successfully used in the manufacture of commercial cutters, they usually require special set-ups or back-off attachments. Usually, too, skilled or specially trained operators are required. In consequence, these conventional methods are not ordinarily applicable to the average tool room assigned to the making of occasional special or even standard cutters.

Overcoming these objections is a simple yet highly efficient method of backing off cutters, developed by R. W. Andreason, President of Detroit Reamer & Tool Company. The method has been successfully used for some time by this company on commercial tools, and has proved thoroughly practical.

By the Andreason method various types of cutters, such as spiral or straight milling cutters, end mills, reamers, etc., may be backed off to any circularity degree of clearance, on any cutter grinder having a swivel head, and by any toolmaker or operator familiar with cutter sharpening. Except for a simple guide block for the diamond wheel dresser, no special attachments are necessary.

Tool Life Lengthened

By this method, too, a tool may be sharpened or reworked indefinitely—or as long as there is stock to take the strain of the cut. This is because a tool may be sharpened on the face, as with form cutters, or, if preferred, on the diameter. Moreover, tool life is increased many times—in some cases from 4 cuts per grind, by conventional methods, to as high as 80 pieces with the Andreason method.

Referring to the illustrations, Fig. 1 shows a cutter backed off with conventional circularity relief (Blade A) and the modified — or flat — relief (Blade B). It is with the modified relief that we are concerned. And here, the depth of the chord, in the short arc of the blade—exaggerated in the illustration—is so slight that no appreciable loss of strength is entailed. Depending on the limits of tolerance, a cutter may be originally ground to the high limit and have considerable life before being ground to the low limit.

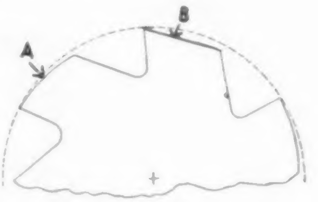


FIG 1

Fig. 2 shows a conventional, swivel head cutter grinder with the work in place, also, the general set-up. Fig. 3 is a plan view, looking down on the wheel, with the cutter, held between centers, immediately below. Fig. 4 is a sectional view through the cutter, showing relation of wheel to the relief, and the cutter guided by a finger. Fig. 5 shows the diamond wheel dresser on the inclined guide block.

At first glance, one may be inclined to question the method of set-up. Why not, for example, grind with a cup wheel from the side, or with the face of a plain wheel, from above? The reason: experience has shown that such grinding results in chatter, whereas with the method shown an exceptionally fine finish is obtained and chatter is eliminated. This is mainly because the thrusts are correct; the thrust of the wheel toward the spindle, and the thrust on the work downward, toward the table. Furthermore, by changing slightly the relation of angularity—as by moving the table up and down or in and out in relation to the bevelled grinding face of the wheel—the angle of relief is easily controlled. Having been proven commercially successful, the method may be safely and advantageously used as shown.

***R. W. Andreason*, President of Detroit Reamer & Tool Company, and a member of Detroit Chapter, A.S.T.E., has developed a simple yet efficient method of backing off cutters—as spiral end mills, etc.—which is described in the body of this text. The method has been successfully used, on commercial tools, at Detroit Reamer & Tool for some time—long enough to prove it practical.**

Now, however, that wartime demand taxes the cutting tool industry to the limit of capacity, often making it necessary for products manufacturers to fabricate their own reamers and milling cutters, Mr. Andreason makes the method public property. As he put it to our reporter: "I am glad to pass the idea along, to anyone interested, through the American Society of Tool Engineers and its publication, THE TOOL ENGINEER."

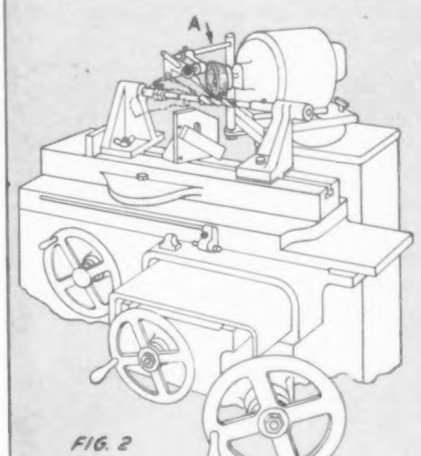


FIG. 2

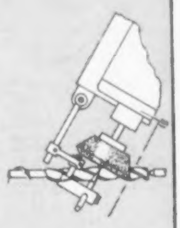


FIG. 3

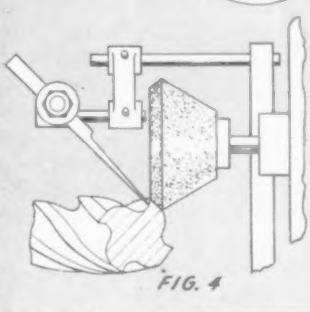


FIG. 4

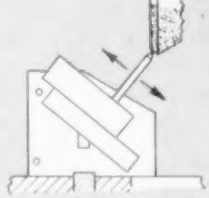


FIG. 5

By Dr. M. Kronenberg

The Inclination of the Cutting

Correct Design of Cutting and Milling Tools by this Method Will Decrease Work Spoilage from Curling Chips

TOOL ENGINEERS are familiar with the fact that the direction of curling of a chip produced by a planer tool depends to a large extent on the angle formed by the cutting edge and the direction of travel.

When the cutting edge is at a right angle to the direction of motion, the chip rolls up in a flat spiral not deviating appreciably from this direction. However, when the cutting edge is oblique to the direction of travel, the chip forms a helix curling either to the left or right side of the tool with respect to the direction of motion.

Similarly, in the case of a *plain* milling cutter with teeth parallel to the cutter axis, the chip escapes in the direction of relative motion of cutter and work (i.e. perpendicular to the cutter axis) but it forms a helix, travelling to the left or right in case of a *helical* milling cutter, depending upon the direction and magnitude of the helix angle. In this

Dr. Max Kronenberg **has been associated with the Research Department of the Cincinnati Milling Machine Co. since 1936, and at present is a consultant to the War Department. Born in Berlin, Germany in 1894, he graduated as "Academic Engineer" from Berlin Technical University in 1920, and spent 15 years in engineering work in Europe.**

case, the direction of chip flow is also affected by the friction between chip and tool.

The helix angle can easily be determined by rolling a helical milling cutter with light pressure over a sheet of paper. Indentation marks thus produced on the paper by the cutting pages are straight lines and oblique to the direction of travel. The angle between the cutter axis and the cutting edge (indentation marks) is the helix angle, or—introducing a term applicable to all types of cutting tool—the "angle of inclination of the cutting edge." This corresponds, in a planer tool, to what is sometimes called "shear."

Since the cutter axis is perpendicular to the direction of travel, no change in concept is involved by saying that the angle of inclination is the angle between the cutting edge and a perpendicular to the relative motion of tool and work.

Generalized Definition of the Angle of Inclination

The existence of an angle of inclination is less easily visualized and measured in the case of lathe tools and face mills, than on planer tools or helical milling cutters. This is due to the effect of the corner angle (chamfer angle, or side cutting edge angle on a lathe tool) or the radius of the tool nose.

While the angle of inclination of a helical milling cutter is identical with the helix angle which in turn is identical with the axial rake, such a simple relationship does not exist when the cutting edge is chamfered or round.

Referring to Fig. 1, the straight cutting edge of a lathe tool and likewise of a tooth of a face mill is indicated by S B^1 as projected to the left from the plane view. The line S B passes through the axis of rotation, thus the direction of relative travel of work and tool at the point S is indicated by B B^1 which is perpendicular to the line S B. The angle $B^1SB = \delta$ is therefore the angle of inclination.

The angle of inclination of any point of the cutting edge may thus be defined as the actual slope of the tool face with respect to a (radial) plane perpendicular to relative motion of tool and work at that point.

This definition implies, correctly, a variation of the angle of inclination from point to point on the cutting edge due to the change in the direction of the radial plane through these points. This change, however, is very small whenever

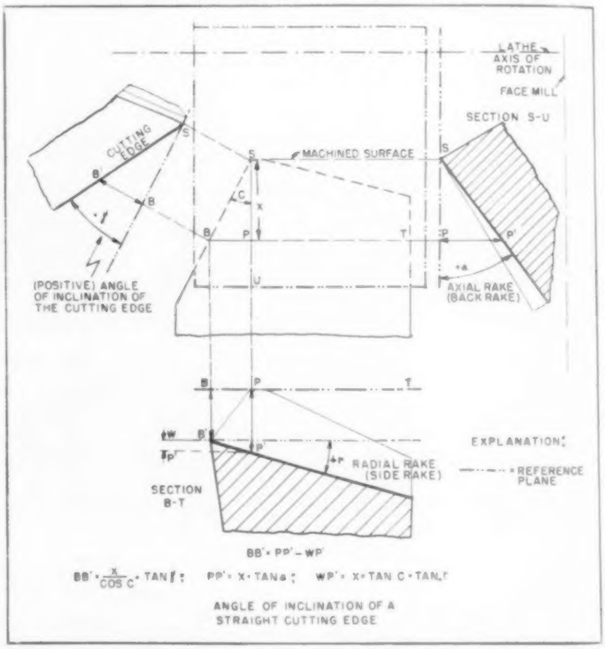


Fig. 1. Diagram illustrating principles involved.

the length of the cutting edge is small in comparison with the radius of the rotating body, and may in practice be neglected for face milling and general turning operations. Hence for these operations all geometric relationships can be considered with respect to a so called *reference plane*, or the radial plane passing through the "point of the tool." *

The point of the tool shall be understood as that point on the cutting edge which is closest to the machined surface (Point S in Fig. 1 and 2). The term machined surface is used here as defined in the American Standards A S A B 5.13–1939.

Measuring Angle of Inclination

The angle of inclination is measured in a plane perpendicular to the reference plane and passing through the cutting edge, a plane which may be termed "transient plane." In the case of a rounded cutting edge the transient plane is tangential to the cutting edge and therefore changing from point to point.

* The Reference Plane is passed through point S of the tool because axial rake and radial rake refer likewise to this plane.

Edge and it's Relation to Chip Curling

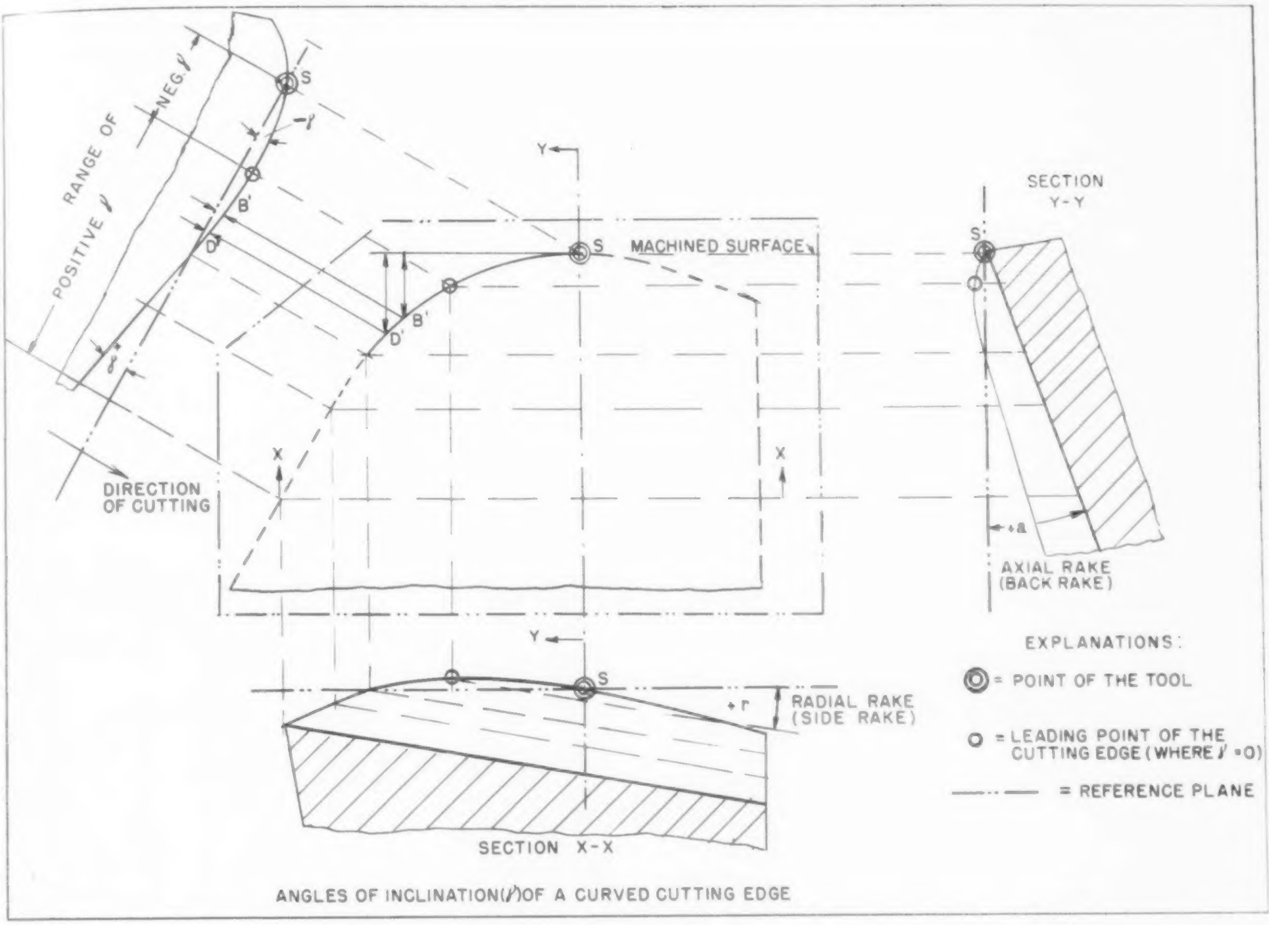


Fig. 2. With curved cutting edge, leading or trailing point may not coincide with point S.

Equations Involved

It will be seen from Fig. 1 that the equation for the angle of the inclination of cutting edge is

$$\tan \delta = \tan a \cdot \cos c - \tan r \cdot \sin c \qquad (1$$

where δ = angle of inclination of cutting edge
a = axial rake on face mill (or back rake on lathe tool)
r = radial rake on face mill (or side rake on lathe tool)
c = corner angle on face mill (or side cutting edge angle on lathe tool)

A definition of the *sign* of the angle of inclination must obviously cover not only the conditions of a straight cutting edge but also the more complex conditions of the rounded tool nose particularly occurring on lathe tools. Therefore, referring to Fig. 2, the following convention corresponding to the definition of the sign of the axial rake (or back rake) has been adopted:

A positive angle of inclination is characterized by the fact that of two adjacent points (B′ and D′) on the cutting edge the one (B′) closer to the machined surface leads the other one (D′) with respect to the reference plane in the direction of motion. The direction of motion is understood to be the direction in which the tool moves relative to the work (i.e. the workpiece is considered stationary).

In the case of a straight cutting edge, therefore, the "point of the tool S", Fig. 1 leads other portions of the edge with respect to the reference plane if the angle δ is positive, and trails them if δ is negative. If straight cutting edge lies in the reference plane, the angle of inclination is zero. In the case of a curved cutting edge, however, the leading or trailing point does not necessarily coincide with the point S of the tool, (Fig. 2) but will be elsewhere on the cutting edge as discussed later on.

Importance of the Angle of Inclination

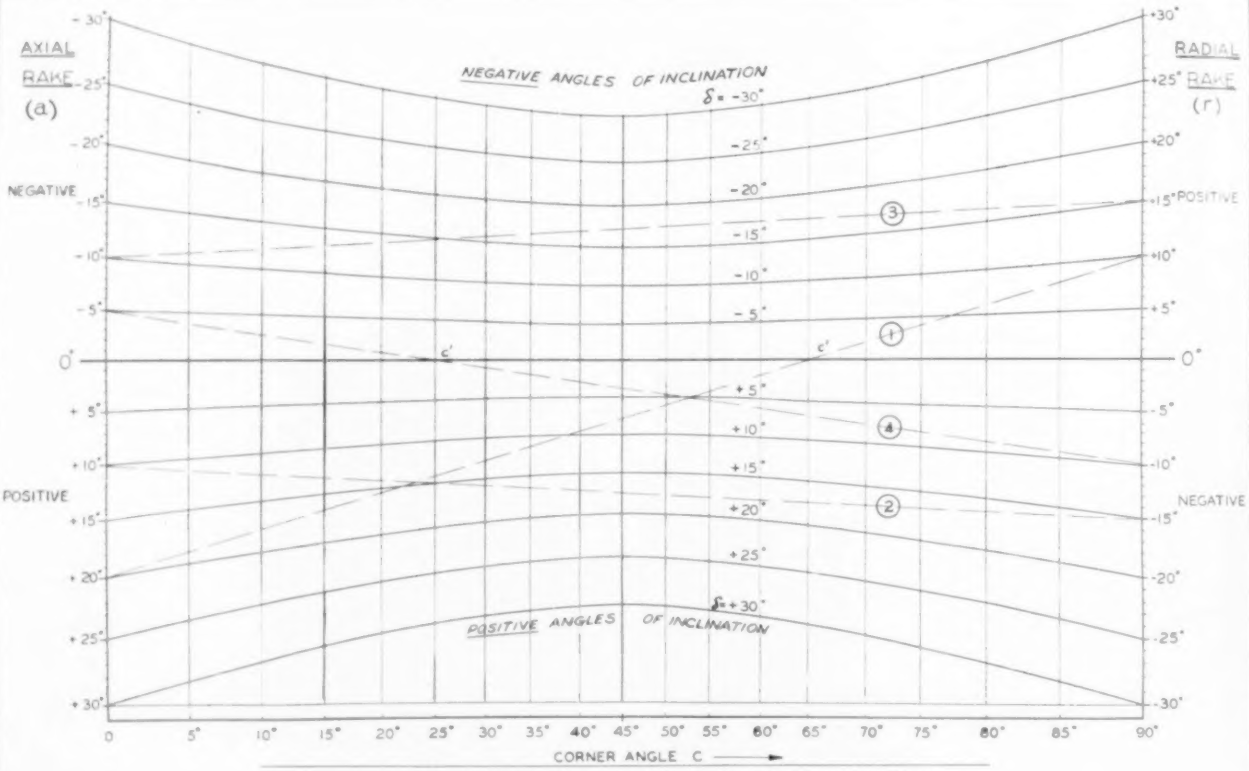
The importance of the angle of inclination lies in the fact that it allows—within limits—control of the direction of curling of the chip. Except in cases of high friction, a positive angle of inclination will in general indicate a "helixing" of the chip *away* from the work on the lathe, or *out* of the space between face mill and work on a milling machine. A negative angle of inclination indicates the opposite direction of helix motion. Since the angle of inclination is the angle between the cutting edge and a perpendicular to the direction of travel it is also the angle between a perpendicular to the cutting edge and the direction of travel. If friction

is low the chip flows almost perpendicularly to the cutting edge, i.e. at an angle very nearly equal to the angle of inclination with respect to the direction of travel (provided that only a single cutting edge is engaged). With increasing friction the chip flow angle will become smaller than the angle of inclination.**

A change in the helix of a chip during cutting indicates a change in friction, viz. an increase in friction if the helix decreases and vice versa, or it indicates a change of the contour of the cutting edge.

Alignment Chart for the Angle of Inclination of the Cutting Edge

Since it is necessary for the practical designer and user of cutting tools to take the angle into account, it is desirable to have some easy means for determining what this angle will be for a given combination of its three components.



ALIGNMENT CHART FOR THE ANGLE OF INCLINATION OF THE CUTTING EDGE

Fig. 3.

$\tan \gamma = \tan a \cdot \cos c - \tan r \cdot \sin c$

Fig. 3 is the graphical representation of equation (1) permitting the reading of the value and variation of any one of the angles if the three others are given or varied. *It is only necessary to draw on the chart a straight line connecting the given angles.* If the angle of inclination is to be determined, the given value of the axial rake *a* should be connected by a straight line with the given value of the radial rake *r*, then the angle of inclination δ can be read for any value of the corner angle *c* at the intersections of the straight line with the vertical "c" lines.

On the other hand, if a certain value of the angle of inclination δ is desired and angles *c* and *r* are given, the required axial rake *a* can be determined by connecting the xδ—c intersection with the *r* value. The axial rake *a* can then be read on the *a*— scale. Correspondingly, the required radial rake *r* can be determined if δ, *c*, and *a* are given.

From the examples shown on Fig. 3 by dotted lines 1, 2, 3, and 4, the following general conclusions can be drawn:

1. In the case of a conventional rake combination (positive axial rake and positive radial rake) the angle of inclination will be zero at a definite corner angle c'. For smaller corner angles than c' the inclination angle δ will be positive and it will be negative for corner angles larger than c'. Hence, it is possible to select (from Chart 3) corner angles giving positive or negative angles of inclination.

Furthermore, for the case of a *curved contour* of the cutting edge, Fig. 3 indicates that some portions of the edge will have positive and some negative angles of inclination. The corner angle c for which the angle of inclination is zero indicates the location of the leading point on the cutting edge remote from point S. (See Fig. 2). Hence, in the case of a positive-positive rake combination δ will be negative in the vicinity of the point of the tool S because of the radius of the tool nose.

2. In the case of a positive-negative rake combination (a=positive, r=negative) the angle of inclination will always be positive for corner angles c up to 90°, hence the point of the tool S will always lead other portions of the main cutting edge.

3. In the case of a negative-positive rake combination (a=negative, r=positive) the angle of inclination δ will always be negative for corner angles c up to 90°. Hence the point of the tool will always trail other portions of the main cutting edge.

4. In the case of a negative-negative rake combination (a=negative, r=negative) the angle of inclination δ will become zero for a definite corner angle c'. For smaller corner angles than c' angle δ will be negative and it will be positive for corner angles larger than c'.

** M. E. Merchant, Basic Mechanics of the Metal Cutting Process, Journal of Applied Mechanics, Sept. 1944, Vol. II, No. 3.

Here again a combination of negative and positive angles of inclination will occur on *curved cutting edges*. In this case, however, the corner angle c' for which the angle of inclination is zero indicates the location of the trailing point of the cutting edge, remote from point S. Hence, in the case of a negative-negative rake combination δ will be positive in the vicinity of the point of the tool (S) because of the radius of the tool nose.

Peripheral Milling

Since the corner angle c on peripheral milling cutters is always zero, the formula for the angle of inclination developed above, applies also to peripheral milling operations if the substitution $c = 0$ is made. The angle of inclination of the cutting edge is identical with the helix angle measured with respect to the cutter axis. The relationship then simplifies to the following angle of inclination (helix angle):

$$\tan \delta = \tan a$$

Acknowledgment

The author wishes to express his appreciation to Mr. Hans Ernst, Research Director and also Dr. M. E. Merchant, physicist of the Research Department for their helpful suggestions in the preparation of this article.

Ultra-Precision In Parabolic Reflectors

To CALL a searchlight a tool may be stretching a point somewhat—actually, about 20 miles when it comes to reflectors for Navy searchlights capable of throwing a parallel beam of 30 million candlepower that distance. Yet, a tool it is, every bit as much as the range finder and the tools of destruction used to reduce enemy power. And therein lies a story, highlighted by President K. T. Keller of the Chrysler Corporation at a recent stockholders' meeting, that may truly be called one of the romances of the industrial world.

It is a story that embraces physics and optics, painstaking research and intensive development, and a near ultimate in precision engineering and manufacture seldom approached in the field of mass production. For consider this, that the beam of light, directed by the reflector, must be parallel

24" searchlight reflectors, for the Navy, have been turned out in large volume by Chrysler Corporation. Above, a laboratory technician is placing a small bulb at the focal point of a reflector to test for parallelism.

within .0008" at a distance of two miles—a degree of precision that, reduced to the proportion of an ordinary plug gage, would imply a parallelism far transcending the microinch. Yet, the story can only be told in prosaic terms.

Thirty Million Candlepower

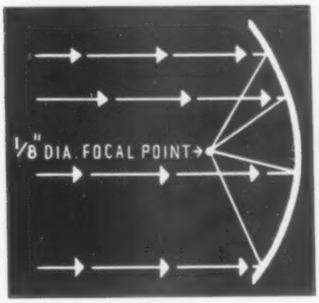
Quoting Mr. Keller: "Some idea of the power developed with a reflector of this sort is indicated by the fact that if a two thousand candlepower arc—the size generally used in 24 inch lights—should be placed at the focal point, the result would be a thirty million candlepower beam. That is more light than would be developed by the headlights of three hundred automobiles if they could all be put together."

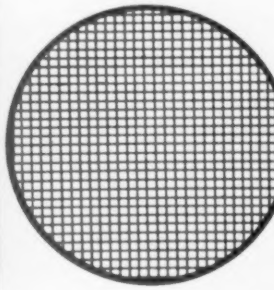
The reflectors are made from stellite—a non-magnetic cobalt-chromium-tungsten alloy—which is one of the hardest known metals. They must be resistant to corrosion and tarnishing from brine spray and gaseous fumes, to oxidization and damage from the heat and sputter of electrodes, as well as scratching from polishing and, finally, they must be rugged enough to withstand the shock of concussion from gunfire.

To divulge actual techniques of manufacture is not in order at this time; however, the manufacture involves the application of Chrysler's peacetime method of polishing metals by the process known as Super-finish, wherein metal surfaces are reduced to a flatness of one microinch. By special, electronically controlled machines, previous flatness has been resolved into a 24" parabolic shape that is subsequently polished to an accuracy of almost unbelievable truth.

Photographic Inspection

To check accuracy, Chrysler developed several optical tests. In one test, beams of light are thrown on the reflector surfaces, the reflected light passing back to a photographic film, where it is recorded. The beam is required to pass





Reflectors are also tested by photographing the light reflected on a board ruled off into 8,464 squares. Wavy lines in the photograph indicate error in finish.

through a hole not over 1/8" in diameter and at an exact focal point 9.7" from the exact center of the reflector. By focusing a light of known intensity on the reflector, and measuring the intensity of the returned beam, reflectivity is checked.

To check distortions in the shape of the reflector, a board, 92 inches square, is ruled off into 8,464 inch squares. By placing a reflector in front of the board, and photographing the squares as they appear in the reflector, any errors in finish will be shown by wavy lines in the photograph.

For parallel-light-beam test, a small bulb is placed at the focal point of the reflector—i.e., 9.7" from the center. The reflected beam is then directed to a board marked with concentric circles, 20 feet away. At that distance, the beam must exactly fit a pattern 24" in diameter. Amplified, this means an accuracy, in parallelism, of .0008" in two miles.

As a corollary to refined techniques and manufacturing processes, it may be of interest that costs of these reflectors, to the government, have been reduced by 50 per cent, while manufacturing time has been cut 40 per cent and reflectivity efficiency boosted by 15 per cent. Ultra-modern methods have made these economies possible.

THE *Fundamentals* OF TOOL ENGINEERING

The Extrusion of Soft Metals

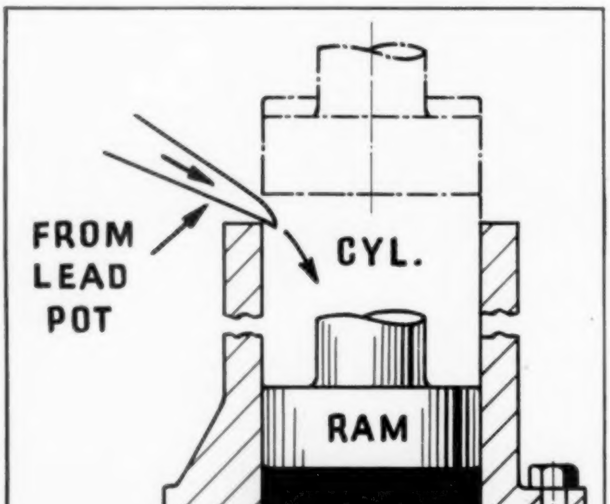
EXTRUSION may be broadly defined as expelling or pushing out under pressure. As applied to the forming of metals or plastic materials, it is the opposite of "draw." The ordinary household meat grinder provides a homely example of extrusion.

There are two basic methods of extrusion: (1) by squeeze, either by means of a worm or by hydraulic (or air) press, and (2), by impact. The first method, which is by far the older, can be applied to hard metals as well as softer materials. The second, which is mainly applicable to the softer metals, as lead, tin or aluminum, is comparatively recent and, of late, has also been applied to the extrusion of hard metals, particularly to bolt manufacture.

Pressure or Squeeze Extrusion of Tubing

Fig. 1 shows method of extruding lead pipe. The lead, in a plastic state—say about 275 degrees F—is forced under pressure through the die, which determines the O.D., while a core sizing plug establishes the I.D., or, as the case may be, the wall thickness.

FIG. 1. Diagram of Extrusion Press for Lead Tubing.



The lead is melted in a pot, or furnace, and poured into the cylinder with the ram raised. A few minutes' cooling is allowed before starting extrusion. Temperatures are controlled so that the lead will flow freely under pressure, yet solidify immediately on leaving the die. The pipe is then wound up on reels.

Lead covered electric cable is similarly extruded, the only difference being that a guide, the I.D. of which corresponds to the O.D. of the cable, replaces the core plug. Note dotted lines inside threaded section of plug, also, compare with guide in Fig. 2.

Fig. 2 also shows a squeeze method, but with worm instead of ram. Here, electric cable is being rubber covered in a tubing machine. Interchangeable dies and guides provide for various sizes. The bare cable is unwound from a reel, and is

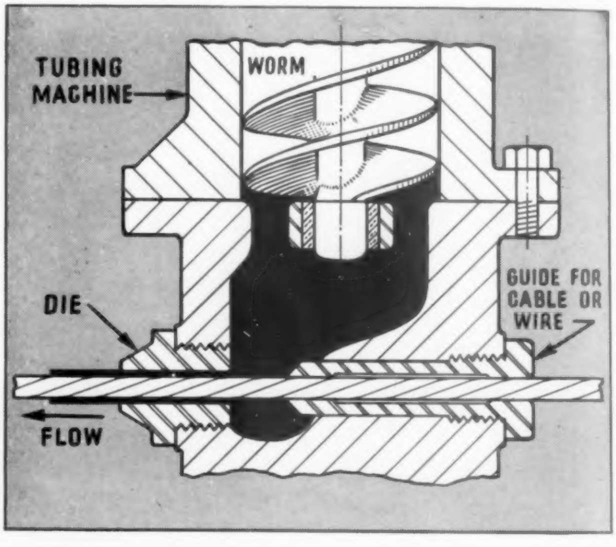


FIG. 2. Typical Worm-feed Press for Rubber-Covering Wire or Cable.

covered in passage through the tuber, where the rubber is forced tightly into the interstices of the strands, or, in the case of solid wire, tightly bonded to the surface. It is then wound around a take-up reel, after which it goes to vulcanizing.

Rubber hose is similarly covered, the process entailing an initial rubber tube which is then braided, and next rubber covered, and so on, according to the number of plies. The rubber comes hot off the rolling mills, and is cut into strips which are fed into the hopper of the tuber, much after the manner of feeding chunks of meat into a grinder.

Impact Forming of Lead Tubing

In Fig. 3 we have impact forming of lead tubing. This method, however, is primarily used for thin wall tubing of short lengths. Pierced slugs, the volume of which should equal the volume of the extruded tube, are fed by gravity

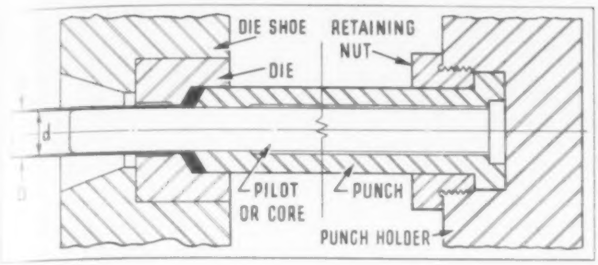


FIG. 3. Punch and Die Set-up for Impact Forming of Lead Tubing.

minute, the press running continuously. Horizontal presses are used—as a Bliss 35 ton—and the tubes are deposited on a sheet of stretched canvas. The lead becomes plastic from the heat generated by impact.

Dies and punches must be very hard, yet tough, and highly polished. Fit between punch and die must be very close, to prevent reverse flow, while clearance between pilot and die—"d" to "D"—must also be closely held. For a .005" wall tube, .001" plus on the die—or minus on the pilot—would entail a loss, in stock, of about 20 per cent. For a rough estimate of volume, a slug 1¼" O.D., x ½" thick,

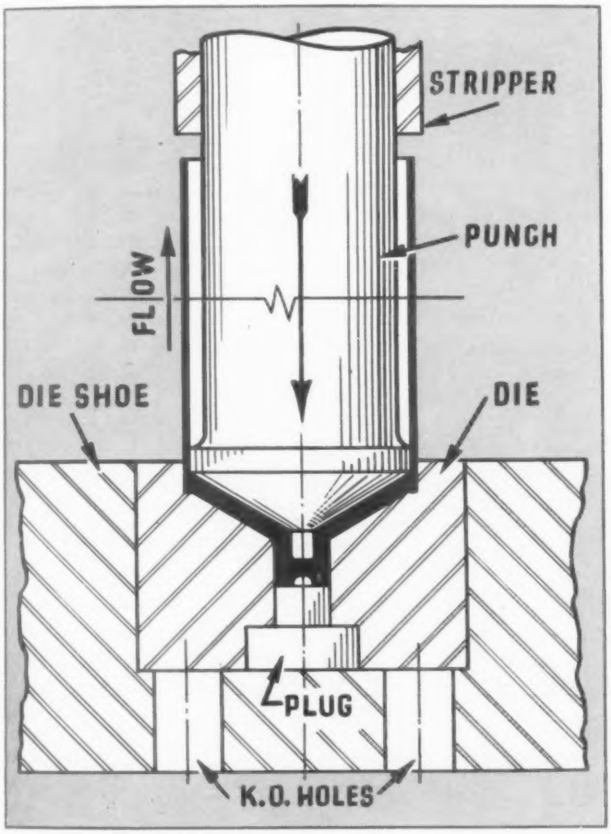


FIG. 4. Tubing Slug Being Forced Through Swaging Dies.

and with a ⅝" hole, would produce a tube about 92" long. In set-up, the ram should be adjusted for a slight over-stroke—just enough to "drag" over center—so as to extrude all the metal.

With either method—squeeze or impact—hollow slugs (Figs. 4 and 5) may be extruded to such lengths that they can be threaded through drawing dies. However, intermediate rotary swaging is sometimes resorted to. With extrusion as one of the preliminary operations, brass, copper or aluminum can be drawn, on conventional wire drawing machines, to specified diameters and wall thicknesses.

Extrusion of Collapsible Tubes

Fig. 6 illustrates method of extruding collapsible tubes, such as are used for toothpaste, etc. Here, the flow is reversed, being upward along the punch. Teats on the punch, and on an opposed plug, indent the thin section of the nozzle, which is later pierced by the consumer.

While threading of the stem can be done simultaneously, this involves complicated, self-opening dies. Hence, threading is preferably a subsequent press operation. A stripper must be provided, as well as a finger for clearing away the

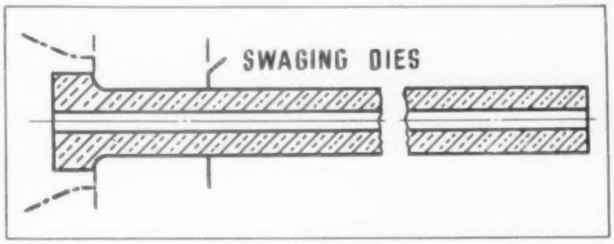


FIG. 5. Tubing Slug Passing Through Series of Drawing Dies.

tubes. For these tubes, vertical or inclined presses are used. As in method 3, relative diameters of punch and die must be closely held, but stroke is adjusted for correct thickness of wall at the blind end.

Of late, extrusion has come into considerable prominence in the manufacture of shells. This however, is a corollary to

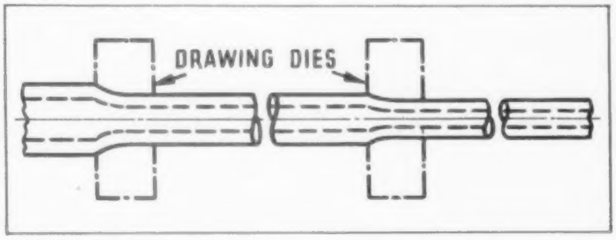


FIG. 6. Typical Set-up for Extruding Collapsible Tubes Such as Toothpaste Tubes.

previous consumer goods manufacture, which in turn may see wider applications because of the experience gained in war production. We may also see considerable extrusion of powdered metals, the only drawback so far being the extreme fragility of the compressed sections. Suitably bonded, however, the shapes may stand reasonable shock prior to fusing. In all, extrusion effects marked economics in the processing of such materials that lend themselves to the methods so far developed.

Watch for This New Series

The foregoing article is the first of a new series on the Fundamentals of Tool Engineering. Next article in the series, to appear in the April issue of *Tool Engineer*, will cover "The Extrusion of Hard Metals."

Intensely practical and up to the minute, these articles will be extremely helpful to tool engineers everywhere. Comments on the series or individual articles, and suggestions for future subjects of special interest to tool engineers, will be welcome.

By P. E. Blackwood

Centrifugal Casting of Tool

THE ART of casting High Speed tool steels is still very much in its infancy. The majority of foundries have hesitated to cast these high alloy metals into tools on a commercial basis. Industry demands that its cutting equipment be of the utmost quality and appearance. Many foundries consider tool steels a job for the forger, and consequently there has been very little development in the casting field.

> *P. E. Blackwood*, **foundry superintendent of the Ford Motor Company of Canada, is an authority on centrifugal casting techniques. A member of the American Foundrymen's Association, he is co-author with John Perkins, Windsor, Ontario, of a "Symposium on Centrifugal Castings."**

Another discouraging factor is from a metallurgical aspect. This condition is brought about by the segregation of the carbides, which at 100 magnifications show up in comparatively large sections in the statically, as cast, structure. Upon heat treatment these segregated carbides do not break up at high temperatures but have a tendency to fuse and upon completion of the treatment have the same properties as before. It is the extremely hard nature of these carbides in a finely defused form that gives the steel its good cutting quality. However, the segregated forms that can not be broken up by heat treatment cause the steel to crack along the brittle carbide lines resulting in early service failures.

In pouring this metal into spinning moulds we find a good homogeneous structure resulting with segregation eliminated and although the carbides are not as finely divided as in the forging the coarse structure tends to give higher cutting qualities and hence longer tool life.

The evolution of this process started in the Ford Motor Co. of Canada foundry about two years ago. We had been making a great number of production castings from Carbon Steels employing the centrifugal method and it occurred to us that a new development lay in the spinning of tool steels.

The first method used was to spin the metal into blanks from which various sizes of milling cutters were machined. The results from these first attempts from a cost to produce angle, as well as better service of the tool, lent the impetus for later development.

Induction Melting Equipment

As to equipment, all our work so far has been done with the 18% Tungsten, 4% Chromium and 1% Vanadium. The melting medium consists of four Ajax-Northrup high frequency (1920 cycle) induction melting pots rated 100 lb. capacity. Neutral Magnesia crucibles are used. The charge consists of 100% used tools, care being taken to keep the two grades of carbon separate. The charge is melted down in 45 min. and a sample taken. This sample is cooled and drilled with a carboloy tipped drill and analyzed for carbon only. If any adjustment is to be made small pieces of pig iron are added e.g.:

Carbon content in bath	.68%
Carbon content required	.72%
Carbon content of pig iron	4.00%
Amount of pig iron used	1¼ lbs.

After the metal has been well skimmed off it is brought to pouring temperature.

Various means are utilized to make patterns in order to obtain the intricacies of design common to cutting tools. As a rule the body of the tool is figured to size, allowing for shrinkage, and 1/64" is added on the cutting edge for finish grinding. In Fig. 1 the dry sand mold for a two lip core drill is shown. This core was made in two halves, a top and bottom. The bottom half has the impression of the cutting edges and the top half the shank. This mold has been sectioned to give the reader a better view. The top and bottom half are located and pasted together. A top and bottom plate are bolted in position from the outside of the mold. The top plate has a hole in the center into which is fitted the standard pouring cup. The whole assembly is then transferred to the Centrifugal machine. Fig. 2 a reamer is molded much the same way with the exception that a flat core is located between the section with the cutting teeth and the bottom plate.

The combination ream and countersink tool shown in Fig. 3 like the previous views has been sectioned for better illustrating values. The difference lies in the method employed for locating the shank. The shank mold is in the form of an inverted truncated cone. The cutting part of the casting is drawn from its half of the mold with a corresponding core print for the shank half.

Fig. 4 represents still another method of mold assembling. Five patterns are used to complete the set. Each row of teeth is made up in an individual section. The five pieces are located by steel rods through the holes in the outer part of the molds. The mold is spun conventionally producing one of the three tools in a rock bit for oil well drilling.

These four castings have all been spun about their own axis but in the case of Fig. 5, a face milling cutter, the casting itself was spun around an axis outside of the casting. This mold is made from dry sand with a core print in the cope and drag for locating the center core. The assembly is bolted together with top and bottom plates in much the same fashion as previously described with the exception that the pouring cup is centered and the casting is spun off center.

Use Green or Dry Sand

The above tool steel pieces can be molded with either green or dry sand. It has been our practice to do most of the actual experimental work in dry sand as it makes an easier medium for cutting gates and establishing risers than the green sand.

The sand mixture used for this dry sand work is as follows:

Bank sand	200 lbs.
Sharp sand	800 lbs.
Cereal Binder	17.5 qts.
Linseed-base core oil	5.6 qts.

The molds are all sprayed with a silica wash and well dried with a gas torch.

Spray mixture:

Water	48 gals.
Silica Flour	200 lbs.
*Bentonite paste	12 gals.
Glutrin	4.8 qts.

*Bentonite paste:

Bentonite	19.2 qts.
Water (180°F)	36 gals

A different procedure is adopted for the green sand molding. Juanita sand is used, mixed with a Kaoline clay. The moisture is kept as low as possible (about 1% to 1.5%). A predetermined amount of sand is distributed over the pattern and a high pressure applied.

The spray is made up of one part alcohol, one part core oil and one part glutrin. Halloysite is added until a specific gravity of 55° Bé is obtained. The molds are sprayed cold,

Steels

• ***Techniques which have proved successful in producing cast high speed tools, and some advantages of centrifugal castings over forgings.***

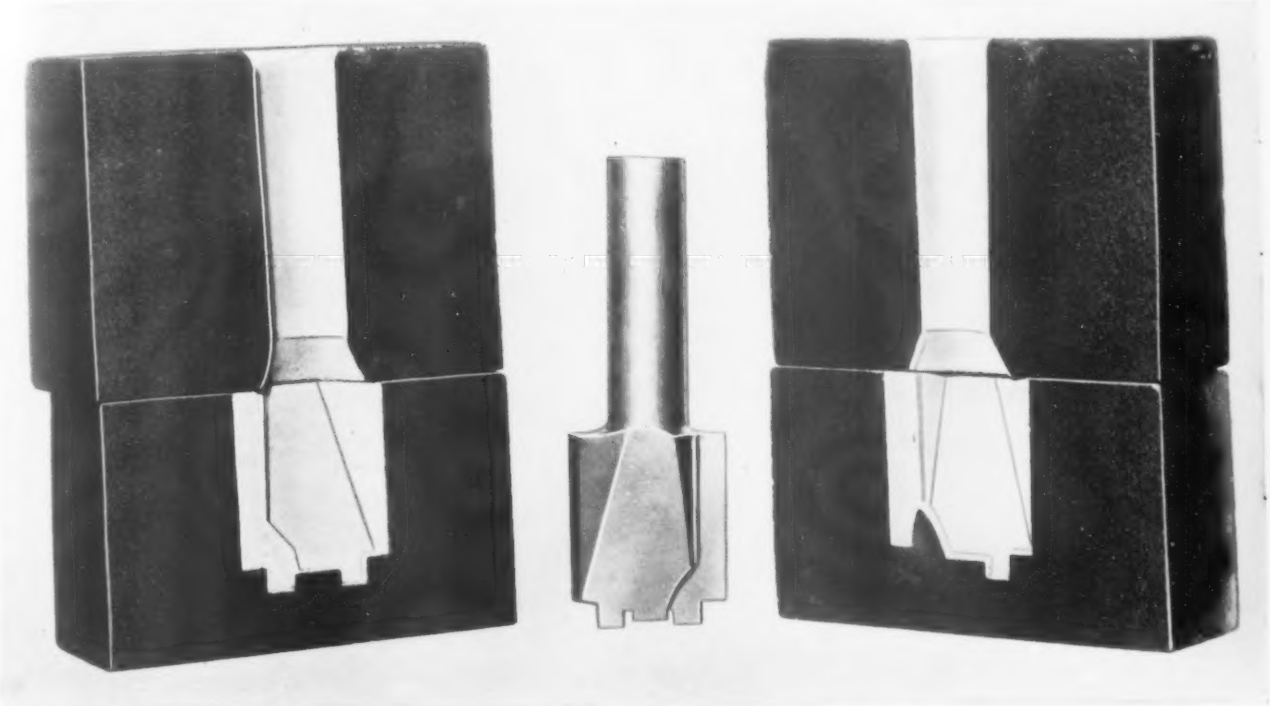
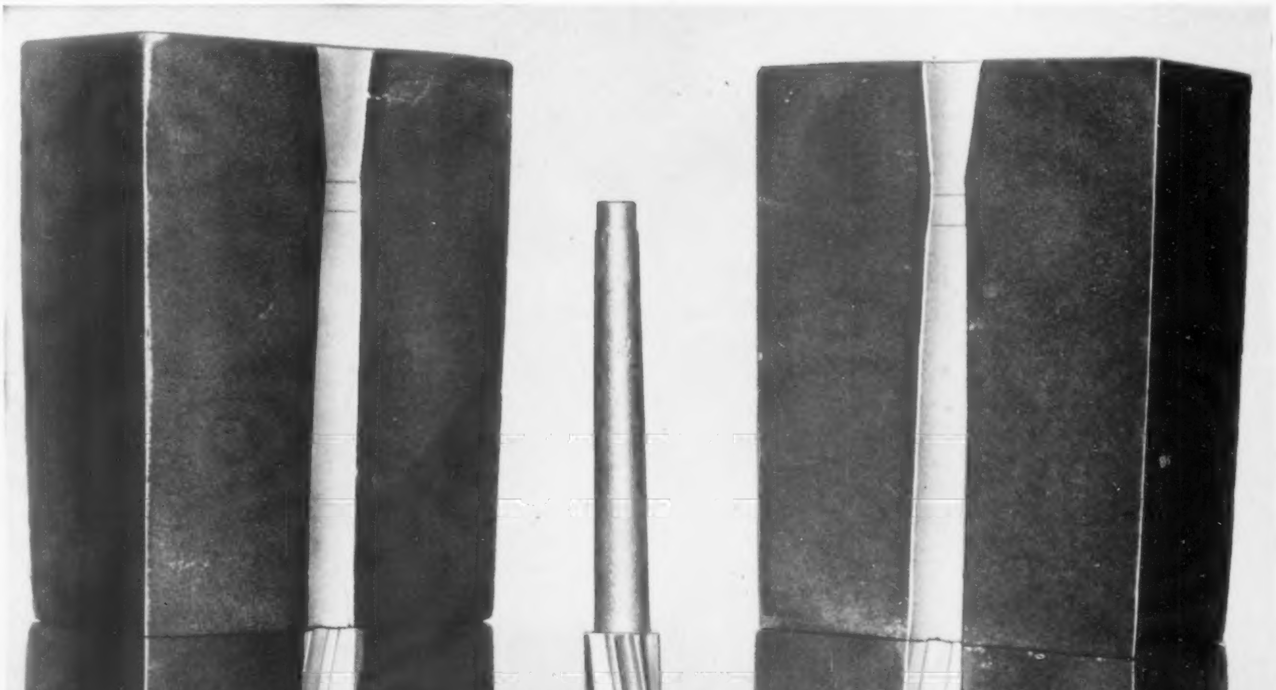
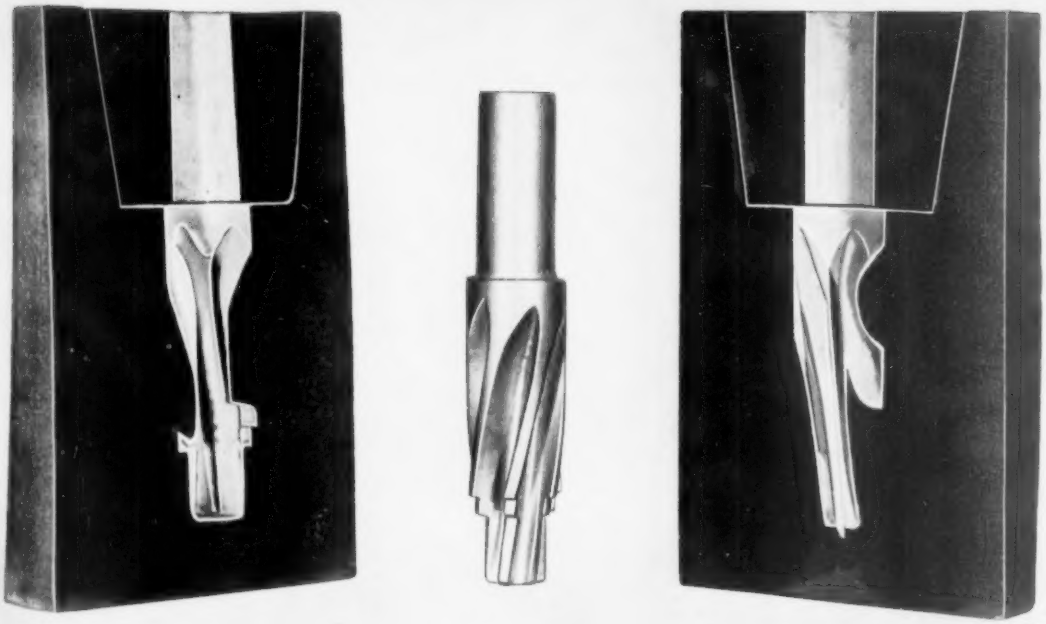
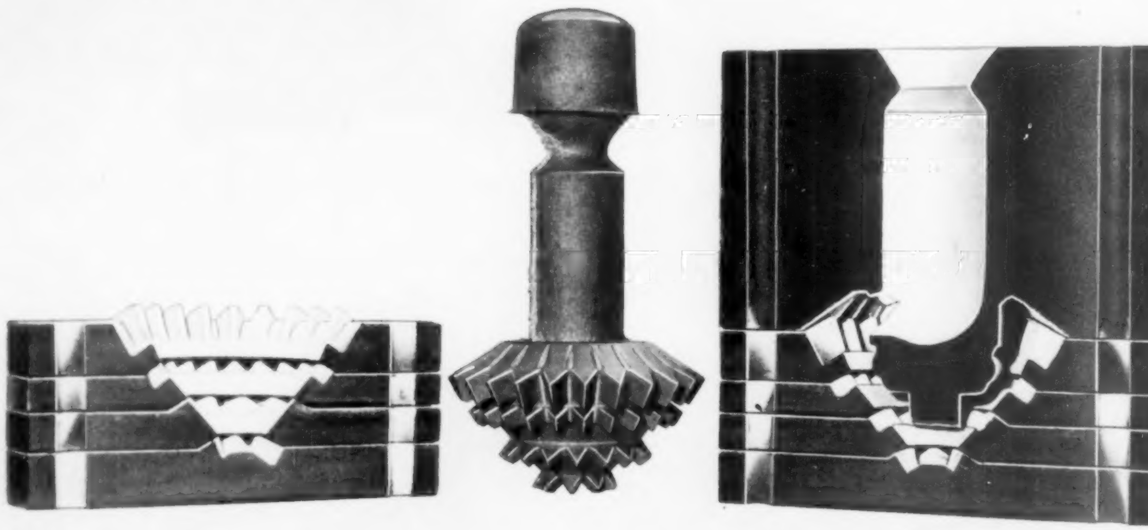


Fig. 1. Above—Dry sand mold for two lip core drill.

Fig. 2. Below—Reamer mold with flat core.







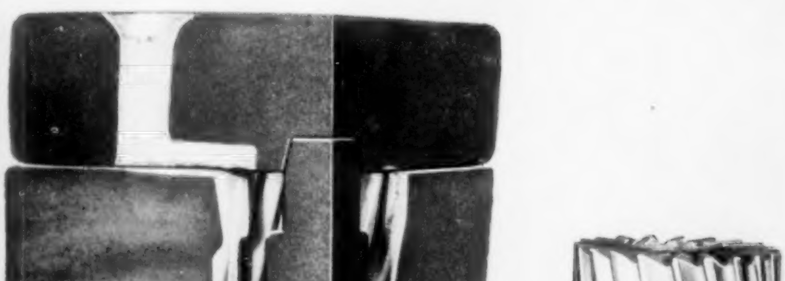


Fig. 3. Top—mold for combination ream and countersink tool.

Fig. 4. Center—5-pattern mold for special milling cutter.

Fig. 5. Mold for face milling cutter, spun off center.

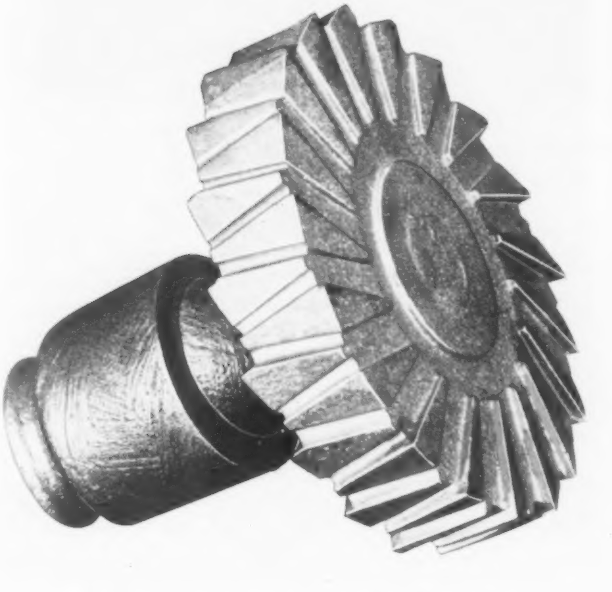


Fig. 6. Casting for stagger-tooth milling cutter.

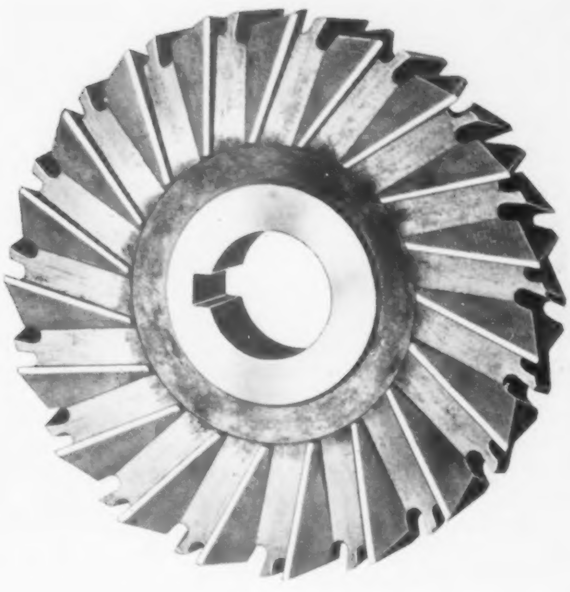


Fig. 7. Finished stagger-tooth milling cutter.

no torch being necessary to make the skin dry.

After a one hour air dry these green sand sections are assembled in the same manner as the previously described dry sand molds.

The spinning unit used in this work is one designed and built in our plant. This particular machine is equipped with a control unit for adjusting the speed of rotation. The machine is located at a suitable distance in front of the induction furnaces. A pot is bolted to a plate on the shaft. The molds are fixed to this part by means of wooden wedges to adjust the pouring cup to a center position.

Temperature and Speed Important

A fundamental principle in all our work on centrifugal casting is that a pouring temperature and a speed of rotation in revolutions per minute have to be established for any given steel and strictly adhered to. For 18-4-1 tool steels, after a certain amount of experimental work, the speed was established at 250 R.P.M. and the pouring temperature at 2950°F.

In the heat treatment of the centrifugally cast 18-4-1 tool steels we have been aided by the applications of the subzero treatment. It is generally accepted that in the normal tool steel treatment of a quench to room temperature and a draw, about 15% austenite is retained. In this retained austenite we have carbon and alloy materials that, to form the best type of cutting tool should be precipitated out in the form of carbides. This precipitation will continue at room temperature but at an exceedingly low rate of speed. It can readily be understood that in the process of casting, heat treating and using, this so called aging is neglected and consequently without the subzero treatment a valuable asset to the steel would be omitted.

Heat Treatment

The heat treatment for all our tool steels consists of a pack anneal in cast iron borings, heated to 1680° F and held for 4 to 6 hrs., depending on the size of the casting. The furnace is shut off and the castings are allowed to cool to room temperature in the furnace. The tool is then preheated to 1600°F and then superheated for 12 min. at 2350°F. It is quenched in lead to 1100°F and then cooled in air. The cooling continues down to -120°F, followed by a draw at 1040°F for 2 hrs. Although this treatment does not transform all the austenite it reduces it to a minimum of about 3%.

Figs. 6 and 7 show a stagger-tooth milling cutter, which is cast to size in the Foundry as shown in Fig. 6. They are used exclusively in the machine shop, and excellent results are reported on their performance.

Pouring metal into spinning moulds is rapidly progressing throughout the country. It is not a cure for all ills, but by following a few simple rules and applying a little common sense, a better casting from both the cost and quality standpoints can be obtained.

War Production and Selective Service

At the Recent War Conference of New England tool and die shop owners, held at Hartford, Connecticut, under auspices of the National Tool and Die Manufacturers Association, the accelerated demands of Selective Service and War Production were stressed by high ranking Army and Navy officers.

Brig. General Alexander G. Gillespie, Commanding Officer of Watervliet Arsenal, spoke on "What the War Department expects of the . . . . Tool and Die Industry in 1945." Citing battlefront figures of two and a half tons of metal thrown against the Germans every minute since D-Day, and 8,000,000 tons every month, General Gillespie stated that: "There must be no let-up in war production. The needs are increasing and it is becoming more difficult to determine what is sufficient. We need tanks, guns, ammunition, trucks and tires and we need them in torrents."

Lt. Commander John F. Robinson, Director of Selective Service for Connecticut, warned industry of further inroads into its personnel. "We are now at the bottom of the barrel and we face increased quotas from the armed forces." Commander Robinson then told the executives assembled that anyone now in a war plant and who tries to change his job without pre-determining through his local board if this is in order, may find himself immediately put into class 1A. The Army has reduced its physical standards to insure induction into work battalions.

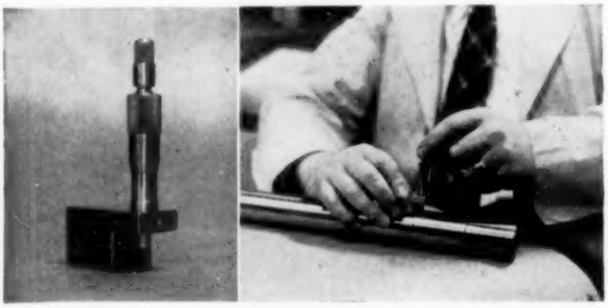
GADGETS

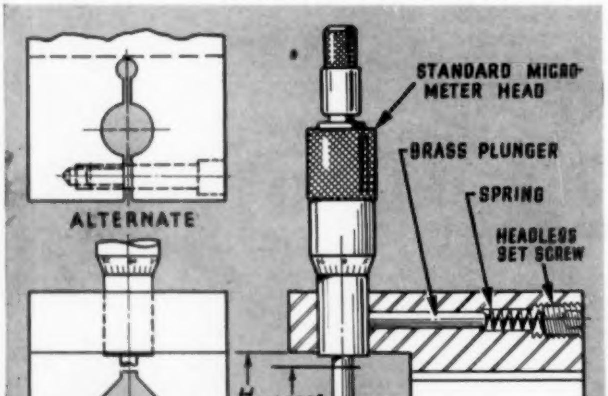
Ingenious Devices and Ideas to He the Tool Engineer in His Daily Wor

The Vee Block Micrometer shown is handy alike for the toolmaker, the machine setter and the inspector. Essentially, it is a Vee block in combination with a standard micrometer head, and while its construction is so obvious that little examination is necessary, a caution or two may be in order.

In boring for the micrometer head, it is of utmost importance that the bore be central with the Vee and at right angles to its axis. That is, a test bar laid in the Vee should be 90 degrees with the bore. Also, both sides of the included angle—which may be 90 to 120 degrees as desired—should be symmetrical in relation to the center line.

It is also desirable, but not essential, that height "H" be such as to provide a full 1" travel of the micrometer. By so doing, the device can be used as a conventional depth or height gage within the range of the micrometer, which may be assumed as 1 inch standard.



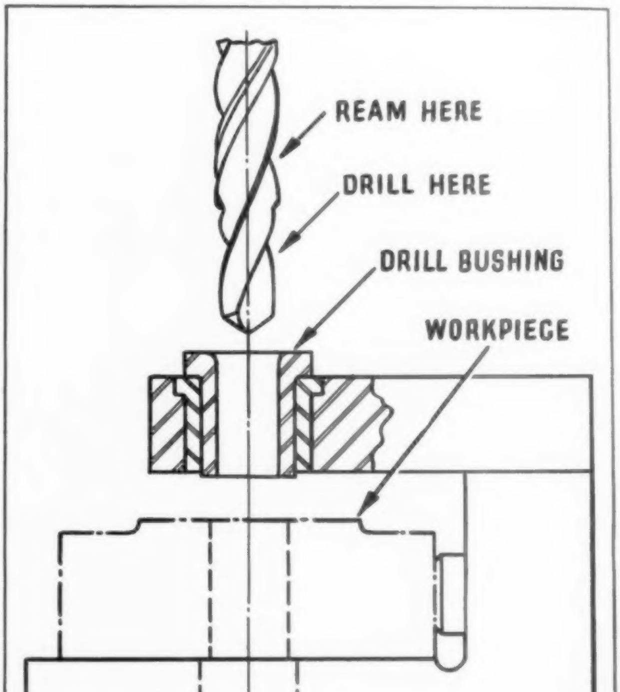


While the micrometer head could be clamped into the block, as shown by the alternate, the idea of using the spring plunger has several advantages. Assume, for example, that a 1½" boring bar is used to bore a 2" hole. The tool would protrude ¼". Now, if the hole is to be increased .010, the gage can be placed on the bar and, by bringing the micrometer spindle down to the point of the tool, a reading taken. Then, following conventional practice, tap the boring tool one half of the desired enlargement, or .005. If the bar runs true, the bore should be exactly as desired—or 2.010.

Now, by means of the tension afforded by the spr plunger, one can not only adjust the micrometer head any desired reading, but one also has the advantage "stepping" the head to zero at any height within the sa range of the bored hole—or within the "bite" of the plung Taken as a whole, the tool is extremely handy for the m chining or grinding of small shoulders, for general measuri or for inspection. Preferably, the Vee block should be har ened and the sides of the Vee, as well as the base surfac hardened.

Daniel E. McDonald
Harrison, N.J.

Drill and Ream in One Pass



The Job: An aluminum workpiece having a .500" hole about 1" deep. To drill and ream in one pass, we ground a ½" drill to 31/64" for a distance of about 1¼". When drilling the ½" diameter is in the bushing when the drill starts, and is guided throughout the cut.

Suited to drilling and reaming where limits of tolerance are not too close, the method obviates both slip bushings and special combination reamer drills. Also, the single tool permits use of a single spindle drill, without need to change from drill to reamer and vice versa.

Seymour Marcus, N. Y. City

By **Roy W. Parkinson**

Spar Milling Without Clamps

• An unusual production boosting method of milling extruded bar shapes without resort to manual, air, or hydraulic clamping.

THE CAP STRIPS to be milled are extruded Vee shape of 118° open angle, 118″ long. The sides or legs have basic wall thickness of .228″, and each leg is 1.375″ from the center line (or bottom of Vee), and both have a convex radius of 11″. Material is 14ST.

Machining Operation:

The machining consists of milling the inside surfaces of both legs for a distance of 74½ inches from one end of cap strip, which starts with a wall thickness of .040″ on both legs and increases, (a straight taper) starting at the 2½ inch dimension line and continuing for a distance of 72 inches. At this point, the wall thickness of both legs have the basic dimension of .288″.

***Mr. Parkinson,* who is a member of Columbus Chapter, A.S.T.E., is Assistant Section Head of the Tool Design Department, Curtiss-Wright Corporation, Columbus, Ohio.**

He has developed testing equipment for use with motor tune-up in automotive service stations, and enjoys an excellent reputation as a designer of automatic machinery.

Fixtures:

The fixture is designed to hold or nest two cap strips, side by side. The radial contour of the outer surfaces of the cap strip is machined in the fixture to provide a solid base for milling. A ⅜ inch reamed hole is put in the finish end of cap strip to insure proper longitudinal location and to act as a dowel to hold it in a positive position, as for climb milling. (The starting end of cap strip is where the cutter starts to cut, the finish end is the opposite end.) ¾ to 1 inch of extrusion is added to each end of the bar, in addition to the specified length, for locating purposes. After all of the machining operations have been completed, the cap strip is cut to its true length, which cuts off the locating hole.

Milling:

The extrusions are held rigidly in the fixture by the use of rollers, that follow the cutters horizontally. The holding pressure is confined to the area being milled. One set of rollers is in front of the cutters and one set of rollers in back or following the cutters. It is necessary to have the rollers as close as possible to the cutters, approximately ⅜″ clearance. The rollers are mounted in holders which have strong die springs that exert a downward pressure of approximately 175 lbs. per roller on the work piece. The holders, in turn, are mounted rigidly on a sub-frame which is rigidly secured to main body of the machine carriage. The rollers remain stationary in relation to the machine carriage, but move horizontally with the cutters, which are free to move vertically to follow the inclines of the tapers. In order to get the rollers up on the extrusions in the fixture and build up the necessary holding pressure, it is necessary to have a ramp, or lead on cam, at each end of the fixture. It is also necessary to have a neoprene wiper in front of the rear rollers to avoid chip marks on the finish.

Cutter:

The cutter body is approximately 8″ in diameter and of very heavy design so that it will act as a flywheel to eliminate vibration. Cutters are all balanced before using, and flange mounted for rigidity. They are bolted direct to milling spindle and located on centering plug. Cutters are two tooth, carbide tipped, the tips being silver soldered direct to shank or cutter body. This type of cutter is less expensive to manufacture, than the inserted tooth type. The teeth have a 10° rake angle, 6° primary clearance and 15° secondary clearance, although, on a form cutter such as this, the shear or helix angle is omitted. The finish obtained is excellent and a tolerance of plus .005, minus .000, is consistently maintained.

Referring to the illustrations, Fig. 1 shows one end of the fixture, with the extruded shapes in place. One Cap Strip—the left hand—is shown rough, the other finished.

Fig. 2 is a close-up showing relative distances of rollers to each other, and to the cutter. The front roller is shown at left, just ahead of the cutter. Note the neoprene wiper in

Fig. 1. Fixture to hold two cap strips.

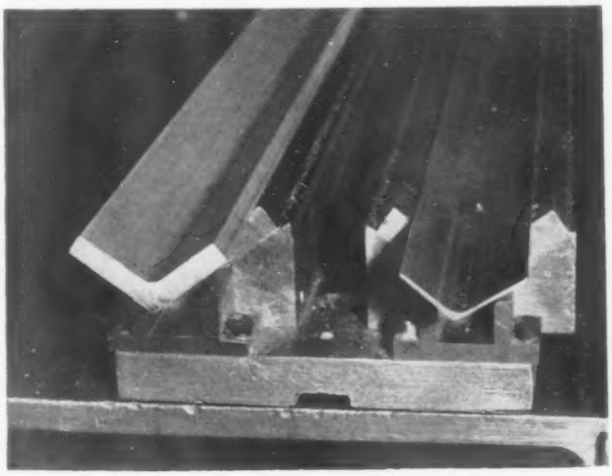
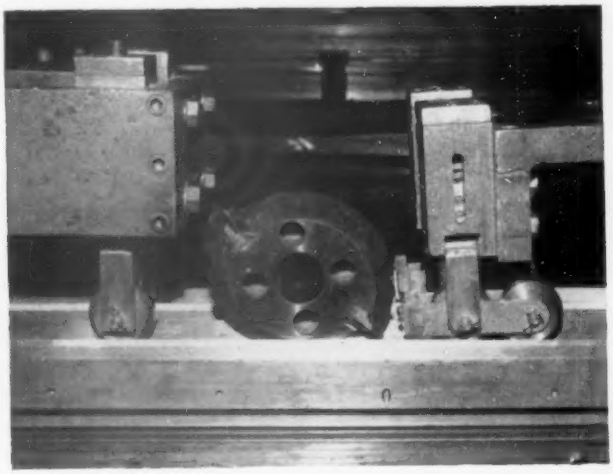


Fig. 2. Extrusions are held firmly in working area by rollers.



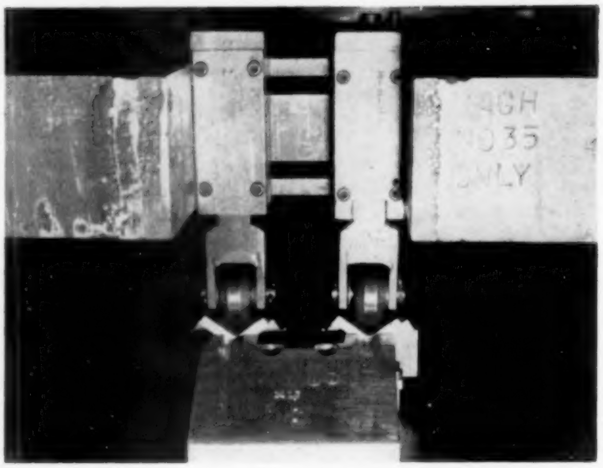


Fig. 3. End view of fixture showing position of rollers.

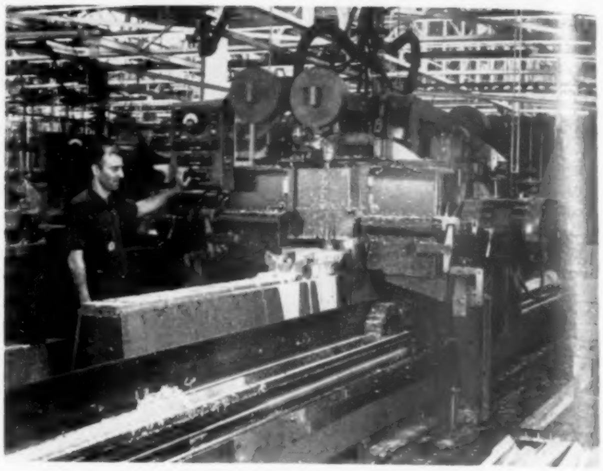


Fig. 4. Farnham 4-headed spar milling machine.

front of the rear roller (right) which prevents chips from becoming impressed into the finished surfaces.

At the extreme right, but mounted in the same holder as the rear hold down roller, is an auxiliary roller which permits the main roller to ride up the ramp onto the work piece. Being pivoted, the wiper is brought down tightly against the work piece the moment the auxiliary roller reaches the top of the ramp. Pressure spring can be seen through the slot directly over the rear primary roller.

Fig. 3 is an end view of the fixture, showing relation of the lead on ramp to the rollers.

Fig. 4 shows the four headed Farnham spar milling machine used for this operation.

Needless to say, the machining operation is very fast, while further time saving is effected by the utter elimination of clamping prior to machining, or when unloading. Furthermore, clamping is uniform throughout the length of the work piece, with the further advantage that pressure can be controlled by increasing or decreasing spring pressures. The net result of high cutter speed, made possible by the carbide tipped blades, the "balance wheel" effect of the heavy body, and the progressively "localized" clamping, is a marked freedom from chatter and vibration and a consequent excellent quality of surface finish.

A. S. A. Proposes Color Code

IN 1927, the American Standards Association effected unification, on a national scale, of the colors used in traffic lights. Today, the A.S.A. proposes a safety color code, which the Association has worked out and which is now being circulated for criticism and suggestions. The purpose of the code is to unify, on a national scale, color markings that may serve as warnings to industrial employees of various hazards, to mark location of safety equipment and to identify fire and other protection equipment.

While undertaken at the specific request of the War Department, the code will have wide application in industry. However, it is not the intent, either as far as the War Department or industry is concerned, to substitute color markings for guards or other safety measures that may be entirely adequate. Rather, it will supplement them.

Standardize Codes Now in Use

Paint manufacturers, who pioneered the use of colors as safety aids, have been consistent exponents of color codes. And, the main job of the A.S.A. committee has been to unify, on a national scale, what has already been done. Codes previously set up by private concerns have been studied and then psychological reactions noted—as, for example, the association of red with danger—in connection with the development of this new draft standard. As a result, a color code should have the same meaning to a garage mechanic in New Jersey as to an industrial worker in Detroit. The value of a standard color code may best be stated in the case of fire, regarding which it has been said that the most important period, in fire fighting, is the first 30 seconds after a fire starts. And here, the quick location of fire fighting apparatus, through color, may mean the difference between an incipient blaze, quickly extinguished, and a costly conflagration.

The A.S.A., in addition to unifying colors used in traffic signals, has also approved a number of standard colors in relation to specific problems and applications. One such is the color code, worked out under the leadership of the A.S.M.E., for identification of piping systems, which was approved as American Recommended Practice in 1928.

Many Codes Already Approved

Among other color codes approved by the A.S.A., is one (approved in 1930) for identifying various types of gas mask canisters. Then, in 1941, an American standard, which provides Specifications for Industrial Accident Prevention signs, was approved.

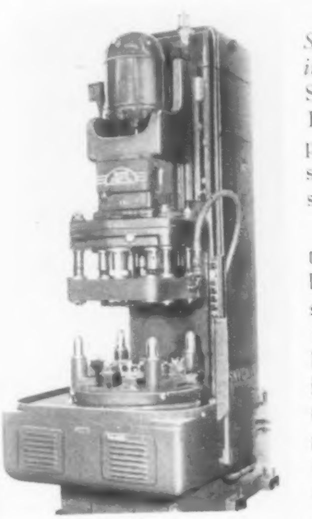
Colored signals and signs are used in navigation and railroading, and for the operation of automobiles and aircraft, and these make it possible for a person unversed in the language of the country, or even for an illiterate, to read the color message of the signs used.

In a sense, all of these color codes paved the way for the over all safety code now completed. However, the A.S.A. Committee assigned to the job feels that co-operation is in order, and invites criticisms and suggestions, from industry, on the draft now being circulated. This aid can be variously rendered, by interested organizations, in various ways.

For example, they can: (1) Study and criticise the draft code; (2) Send to the A.S.A. any technical information which is believed to be of value to the Committee in further work; and (3) they can put the final code into active use so that future changes, to make the code more effective, will be based on actual experience. For such study and recommendation, any organization or manufacturing company may obtain a copy of this draft standard Safety Color Code for Marking Physical Hazards (Z53) by writing to the American Standards Association at 70 East 45th Street, New York 17, New York. There is no charge for copies.

TOOLS OF TODAY

Special Purpose Efficiency



DESIGNED and built by *Snyder Tool and Engineering Company*, Detroit, the Snyder Standard 10 V 18 Drilling Machine shown provides a good example of special application with standard equipment.

Basically a general utility machine, the machine has been equipped with a 5 spindle head and a 4 station index table. The machine hollow mills 20 bosses in its cycle. Absolute alignment is insured by four guide pins; thus, each index will repeat exactly. The index mechanism, which employs the Geneva wheel, with its smooth acceleration and deceleration, is hydraulically powered from hydraulic system of the machine itself. The index table serves as a chip trough and coolant retainer.

Only the equipment—as the 5 spindle head and the 4 station fixture—is special, and the machine can be readily retooled for entirely different production by merely changing or reworking the special equipment. It is available with or without special tooling and speed change transmission for single or multiple spindle adaptation. It is also available in size 20-V-16.

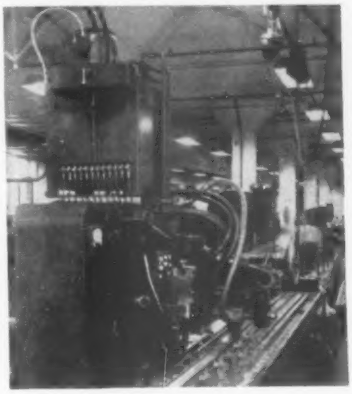
New Aro Line Drills

ANNOUNCED BY The Aro Equipment Corporation, Bryan, Ohio, a new line of powerful air drills have important new features. In addition to one-piece aluminum housings, these include 4-bladed motors, hardened and ground cylinders, 4-ball bearing construction and built-in oilers. Gears and gear cages are precision cut and ground for perfect alignment, reducing gear wear and facilitating assembly.

Model 109, shown in illustration, and Model 1010 operate at 2000 R.P.M. Models 1013 and 1014, designed for aircraft work and other high speed, sustained torque requirements, operate at 4000 R.P.M. All are perfectly balanced and built for 24-hour a day duty. Standard equipment includes 3/16" or 1/4" Jacobs chucks, with 5/16" chucks available.

High Pressure Milling Without Cams

TURCHAN FOLLOWER COMPANY, of Detroit, has devised a new method whereby high pressure milling—as for example, the milling of 16 ft. wing spars—can be done without resort to expensive cams, as in conventional practice.

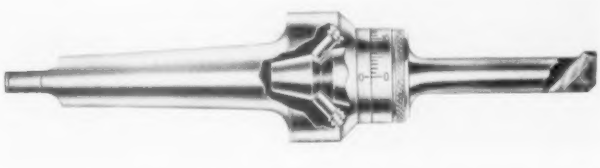


Ordinarily, when milling forms under heavy pressure, and using hardened cams and rollers, the cams tend to change in shape, or to wear out, entailing frequent replacement. With the Turchan Hydraulic Follower attachment, however, expensive cams can be replaced with soft, inexpensive templates, resulting in great savings on quantity production jobs.

As a typical example, 16 ft. wing spars are being machined on a special spar miller—one of the largest machines used in an aircraft plant. As formerly machined, the pressure exerted on the cams was so great that both cams and rollers failed repeatedly. Yet, with the Turchan attachment, a soft template lasts indefinitely, while the milling is also more consistently accurate than was previously possible.

Dial-Set Boring Tool

MANUFACTURED BY State Manufacturing Construction Company, 1955 N. Dixie Highway, Franklin, Ohio, the Dial-Set Boring Tool has a micrometer adjustment effected through an eccentric cone and socket. Exactly centered with the dial set at zero, the quill is then thrown off center, through graduations of .001", to a maximum of .050".



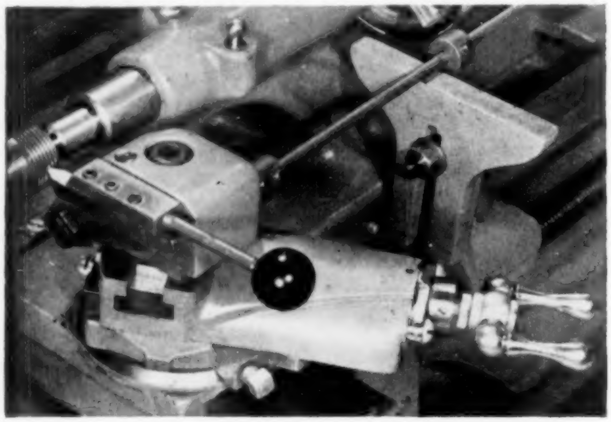
The holder, which comprises a straight or taper shank, the socket and scale, accommodates a jump of 4 or more inserts, which, in turn, consists of the cone, dial, quill and bit. While standard round bits are used, carbide, diamond and other special bits can be furnished.

Secondary increases can be affected, as by changing inserts, a total boring range of 3/8" to 2" is obtainable. The tool is claimed to be rugged and suitable for heavy production work on boring machines. For such machines, holders, with disc bases can be furnished. Complete information can be had by writing the makers.

Retract-A-Tool

As an Innovation even among the most modern tools, a lathe tool holding attachment that snaps a turning, boring or chasing tool out of engagement at any predetermined point should find ready favor among tool engineers and production executives in general.

Called the Retract-A-Tool by its originators, The Foulk Engineering Company of Cincinnati, the attachment is claimed to increase the possible speed of turning or chasing operations by as much as 400 per cent. The retraction of the tool is said to be instantaneous and positive, hence, the operator need only return the carriage to starting point once retracting occurs. The tool is then reset by lifting the ball-end lever shown in the illustration.



The tool offers a further advantage in that it is not necessary, as a rule, to neck the work. And, since no cross-slide movement is necessary, gibs may be tightened on production runs for greater rigidity.

Essentially, the attachment consists of a tool holder and body, with a solid clamping arrangement. There is also a stop-bracket clamped to the lathe bed, between which and the tool holder is an interconnecting rod with the adjustable stop-collar.

This arrangement permits turning or chasing up to shoulders, and is especially applicable when boring blind holes. The tool is made in two sizes to fit the full range of standard bench and engine lathes, and is also adaptable to many turret lathes. An illustrated bulletin, fully describing the tool, may be had by writing the manufacturer at 4208 Airport Road, Cincinnati 26, Ohio.

Glenny Push Broach

Particularly adapted for internal keyway cutting, the Glenny adjustable expansion Push Broach will replace slower and more expensive set-ups besides relieving larger equipment for production runs. The broach may be advantageously used with an arbor press, eliminating power expense, or with air or hydraulic power if desired. It can also be operated from the tailstock of an engine lathe, or mounted on a turret lathe, when bushings or other bored parts may be broached recurrently with the turning operations.

The Glenny Push Broach is manufactured by the East Shore Machine Products Company, E. 140th Street and Aspinwall Avenue, Cleveland 10, Ohio, and is standard on sizes 3/8" to 1½" in increments of 1/8".

Roughness Meter

Physicists Research Company, of Ann Arbor, Michigan, has developed a *Roughness Meter* for control of high explosive, large-caliber shells. Known as Type CP, this instrument measures the average roughness on extremely coarse surfaces, such as on shells, in the same manner as the Profilometer provides readings for comparatively smoother machine surfaces. In fact, the Roughness Meter greatly resembles the Profilometer, the two instruments being essentially similar in principle and operation.

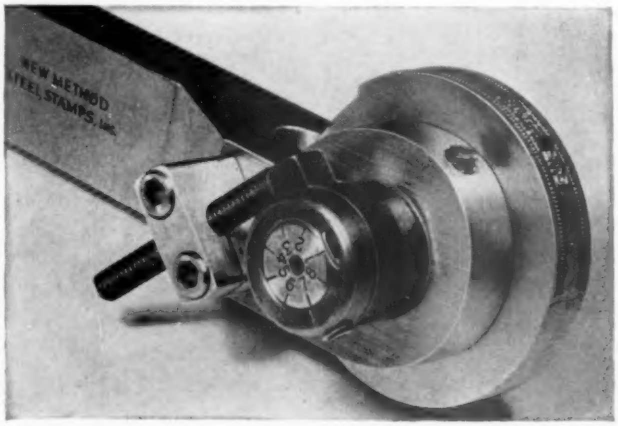
Readings of the average roughness of the surface to be measured are directly in microinches, the meter and scale selector providing full scale range of 300, and 3000 microinches. The Tracer, which is heavier than that of the Profilometer, and ruggedly built for use on rough surfaces, is designed for manual operation. Equipped with a diamond point, it is automatically self-adjusting to any curvature from 1½" O.D. to flat.

Because of the importance of shell manufacture at this time, and the need for a standard of comparison for surfaces, the Roughness Meter may be demonstrated, by Physicists Research experts, at the plant of any contractor now making shells. Full information may be had by addressing the makers at Dept. 49, Ann Arbor, Michigan.

Improved Automatic Roll Marker

A Product of New Method Steel Stamps, Inc., Detroit, an improved roll marker for imprinting serrations features a tension adjustment device for the automatic spring return of the roll marker.

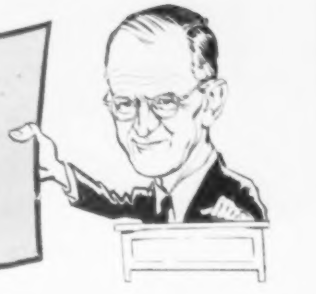
This new roll marker was designed, primarily, for use with automatic screw machines, but can be used on lathes, shapers and other machines where mass quantities must be identically marked.



Adjustment of the tension on the automatic spring return—i.e., from light to heavy—is readily made when changing to larger or smaller marking dies. This also permits adjusting the return speed of the roller to suit machine cycle timing. As an added feature, the automatic spring return is entirely enclosed to prevent damage through accident or careless handling.

While the holder shown is equipped with a solid type roll, interchangeable roll markers are available on order. The tool is standardized as to general design, with shanks for conventional mounting in standard tool holders, but can be custom made to suit special requirements.

ANDYGRAMS



GETTING OUT the February issue was one of those jobs that, as Boss Kettering might say, took more of sweat than of genius. But, caught as we were without a medium wherewith to disseminate essential Know-How of *tool engineering*, as well as to adequately serve our large membership, there was nothing to do but buckle down to work.

Fortunately, we had the foundation—a *good name*—and we built on that. And, behind a pleasing *facade*, there was served the meaty courses of Know-How referred to above, along with items of general interest. And here, I would say that Ade Potter and Doris Pratt are to be complimented on their excellent presentation of A.S.T.E. News. Taken as a whole, and judged by the acclaim with which it was received, the new *The Tool Engineer* is just what our 18,000 members have been wanting these many moons.

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AMONG RECENT VISITORS must be included Arthur A. Nichols, of W. H. Nichols & Sons, Waltham, Mass., with whom I sent greetings to Warren Ames, John Sylvester, Capt. Comroe, Bill Young and other friends in Boston Chapter. Bill, by the way, has made an excellent Director, and we'll probably hear more of him.

J. C. Cotner, G. M. of Air-Hydraulics Div., Gerotor-May Corporation, also visited, bringing with him a story of pneumatics which you'll read in an early issue of *The Tool Engineer*. And, just as I put the period after the preceding sentence, Phil Harrison from Windsor dropped in with late news of doings up in the Dominion. Nice chap, Phil. Typically Canadian.

Had *smorgasbord* at the Norton with Bill Flashenberg, of Flash Tool & Eng'g. Co., Detroit, during which we spent a pleasant hour discussing international affairs. Bill, a former professor of history, has a certain edge in that he majored in the subject, whereas I'm merely an interested student. However, my mother was a lay authority on European history, besides which I've gotten my lore direct from the people—and, to a considerable extent, from locale. Happily, the debate isn't settled, by token of which I look forward to another session. Bill makes a fellow think.

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SPEAKING OF INTERNATIONAL AFFAIRS, it is hoped that the defeat of Germany will usher in an era of international amity and understanding. For surely posterity should profit, in peace and security, from the agony suffered by this generation. Not, in this connection, that V-E Day is "just around the corner" although (hope springing eternal) anything may happen. Germany *may* collapse.

But, as the ring of steel closes around the enemy, it becomes a struggle between desperation, on the part of the erstwhile *Herrenvolk*, and relentless determination on the part of the Allies. And, the latter will prevail, although total Victory portends a staggering toll in human life.

Here, I am reminded of a poem which, dedicated to the English, yet poignantly expresses the spirit of all the Allied fighters. I refer to Laurel Binyan's *For the Fallen*, of which I quote one verse:

They went with songs to the battle, they were young,
Straight of limb, true of eye, steady and aglow.
They were staunch to the end against odds uncounted,
They fell with their faces to the foe.

~ ~ ~ ~

WELL, WE on the home front can't stop bullets that seek out our boys, but, we can back them with *work*. And here, the engineers of America and Canada—yes, and of England—have set an example, in devotion to duty, but seldom approached and perhaps in no instance exceeded by any other class of workers.

Every ship, plane, tank and jeep, and every instrument and accessory needed for their operation; every gun, rifle and implement of ordnance, and the shells, bombs and bullets, had to be engineered before they could be manufactured. And before they could be produced in the quantities needed there had to be *tool engineering* on a scale heretofore undreamed of. And, this work fell to a minority of trained men that, even in peacetime, had been considered inadequate, in numbers, to the load imposed. The miracle is that more of them haven't broken under the strain of wartime demand—perhaps a mastery of mind over matter.

Speaking for myself—and I but use myself as a foil for the many—about the only respite I've enjoyed (?) since Pearl Harbor, has been when too ill to be on the job. Even then paper and pencil has been close at hand.

Since joining the editorial staff of *The Tool Engineer*, I've been more of a technical adviser than an editor.

Demand for Know-How on manufacturing techniques comes from all quarters, and while much of it would be interesting material for publication, the urgency is usually so great that answers must be forwarded immediately—by personal contact, letter, phone or wire. Less urgent matters must simply wait their turn, correspondence often piling up for weeks before there is time for answer. Time? Heck, there just isn't any!

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TIME OR NO TIME, I am looking forward to meeting the Directors when they hold their meeting later in the month. Somehow, I've a hunch that the coming Annual portends great things, not only for the Society, but for the war effort as well. We've good men on the Directorate, and on the Organization Progress Committee, and they've worked hard and unselfishly to make the Society a vital asset to the nation.

Irwin Holland, for one, has done an outstanding job, and merits the highest commendation. The same holds for hard but clean fighting Jim Frederick, to mention but two out of many. Good men, all of them. Too bad we couldn't all have gotten together, but ODT said "no" and, in view of conditions, we were glad to comply. So, we'll discuss our war production problems in the pages of *The Tool Engineer*, in the meanwhile biding a more favorable time for a get-to-gether. But for now, *Aur Revoir*.

Andy

By Lloyd L. Lee

Planetary Thread Milling

New method combines speed and accuracy—especially useful on large work, also for reaming and facing.

EVERY machine tool has its place in modern production, and consideration of the type of equipment entails certain fundamentals. There are general purpose machines, such as the lathe, on which many varied operations can be performed depending mostly on the skill of the operator. And, on the other hand, highly specialized, single purpose, high production machines designed for one particular operation, with the operator's skill limited to pushing a button.

The Planetary Thread Miller—such as the Plan-O-Mill—comes between these extremes in that it can be changed over a considerable range of work, from threading a $\frac{5}{16}$ external thread to threading a 3 or 4 inch internal thread—or for special operations—in a comparatively short time.

On the other hand, Planetary Milling is not practical for very short runs, as universal tooling is not applicable and the cost of cutters, fixtures, etc. is prohibitive on very small quantities. It is, however, exceptionally adapted to production threading of blind holes and for any threading job where accuracy, alignment and finish, coupled with high production, are required. Odd shaped parts present no obstacle and there is no difficulty in threading $3\frac{1}{4}$-16 pitch, class 3 holes, in breech rings weighing 300 lbs., holding parallelism and dimensional limits plus or minus .001".

***Mr. Lloyd L. Lee* is Vice President in charge of Engineering and Sales, Plan-O-Mill Corporation, Detroit. A veteran tool engineer, Mr. Lee started as a tool designer with Oldsmobile in 1915, and progressed steadily from that time on. He was later connected with Eaton Manufacturing Company, as engineer on special mechanical design.**

In the design of any modern, high production machine, there are certain cardinal principles to be followed, viz: rigidity, accuracy, spindle design, ease of operation, simplicity, etc. In a Planetary Thread Milling machine, there are various additional considerations. One of the most important of these is the relation of cutter speeds to feed rate, both for actual feeding and for feeding the cutter depth and for keeping the reversing time down to an irreducible minimum.

Only Three Moving Parts

Plan-O-Mill acomplishes the first of these principles—i.e., rigidity—through its very simplicity. There are only three major moving parts; the Outer Quill which turns in the main head stock housing; the Inner Quill which turns in the Outer Quill only when feeding the cutter into depth, and the Spindle itself which, with anti-friction bearings, is capable of using Carbide Cutters where applicable.

Unlike the conventional thread milling machine, where the work is rotated against the cutter, in Planetary Milling the revolving cutter is fed around the work. One revolution, plus a slight overrun, completes the operation. The part being milled does not revolve, but is rigidly held in a suitable fixture. A typical set-up is shown in Fig. 1 where the work piece is rigidly secured in a heavy fixture. Obviously this fixture could not be revolved around the cutter without heavy counterbalances and a consequent considerable increase in the size of the machine. During the milling operation the re-

FIG. 1. Typical set-up on Plan-O-Mill.

volving cutter moves in a circular path either inside or outside the work, depending on whether internal or external threads are being milled.

This is accomplished as shown in the accompanying diagram, Fig. 2. The cutting spindle A is eccentrically mounted in the Inner Quill (black circle) which in turn is eccentrically mounted in the Outer Quill (white circle). In the Plan-O-Mill, this eccentricity is ⅝" in both cases, so that the cutter can be set on dead center of the Outer Quill.

The work is either loaded over the cutter, in this position, or mounted in a sliding type fixture and located over the

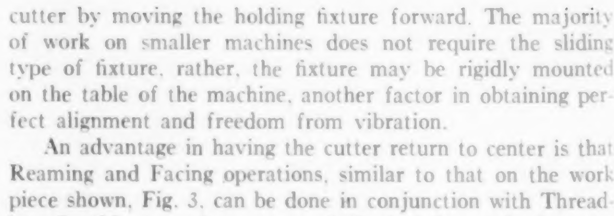
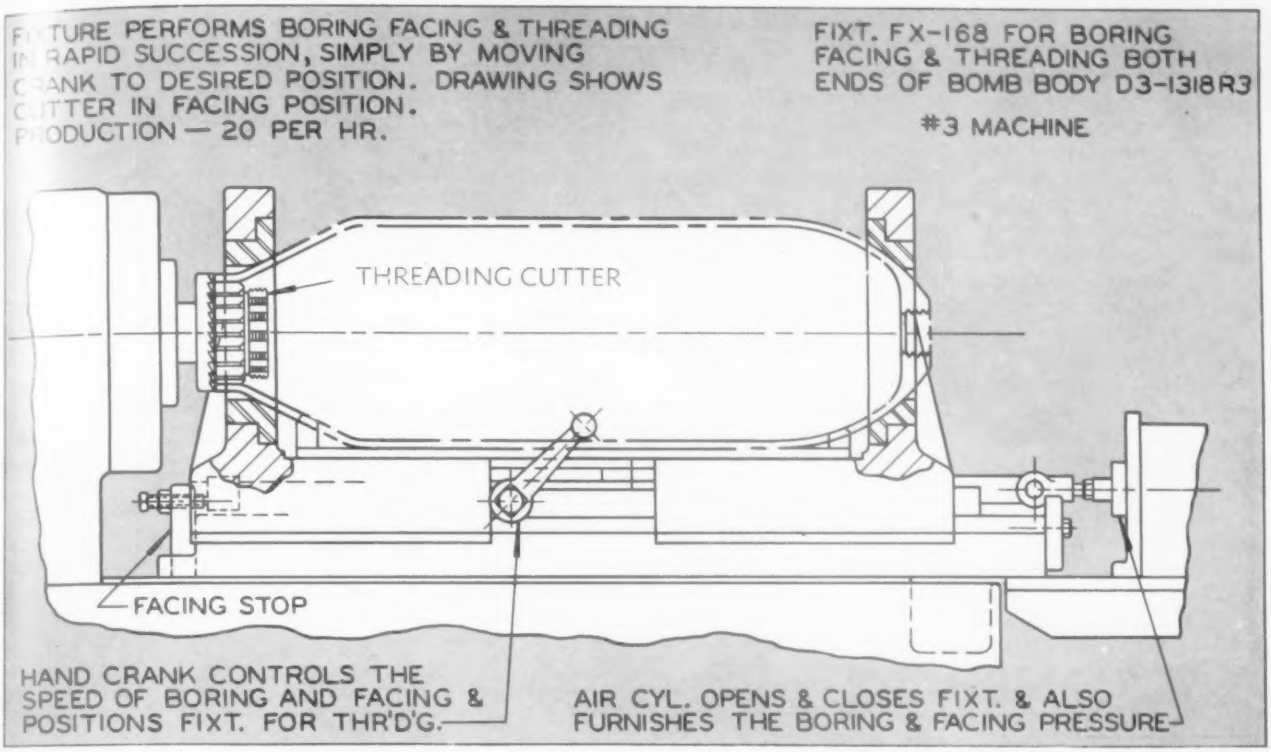
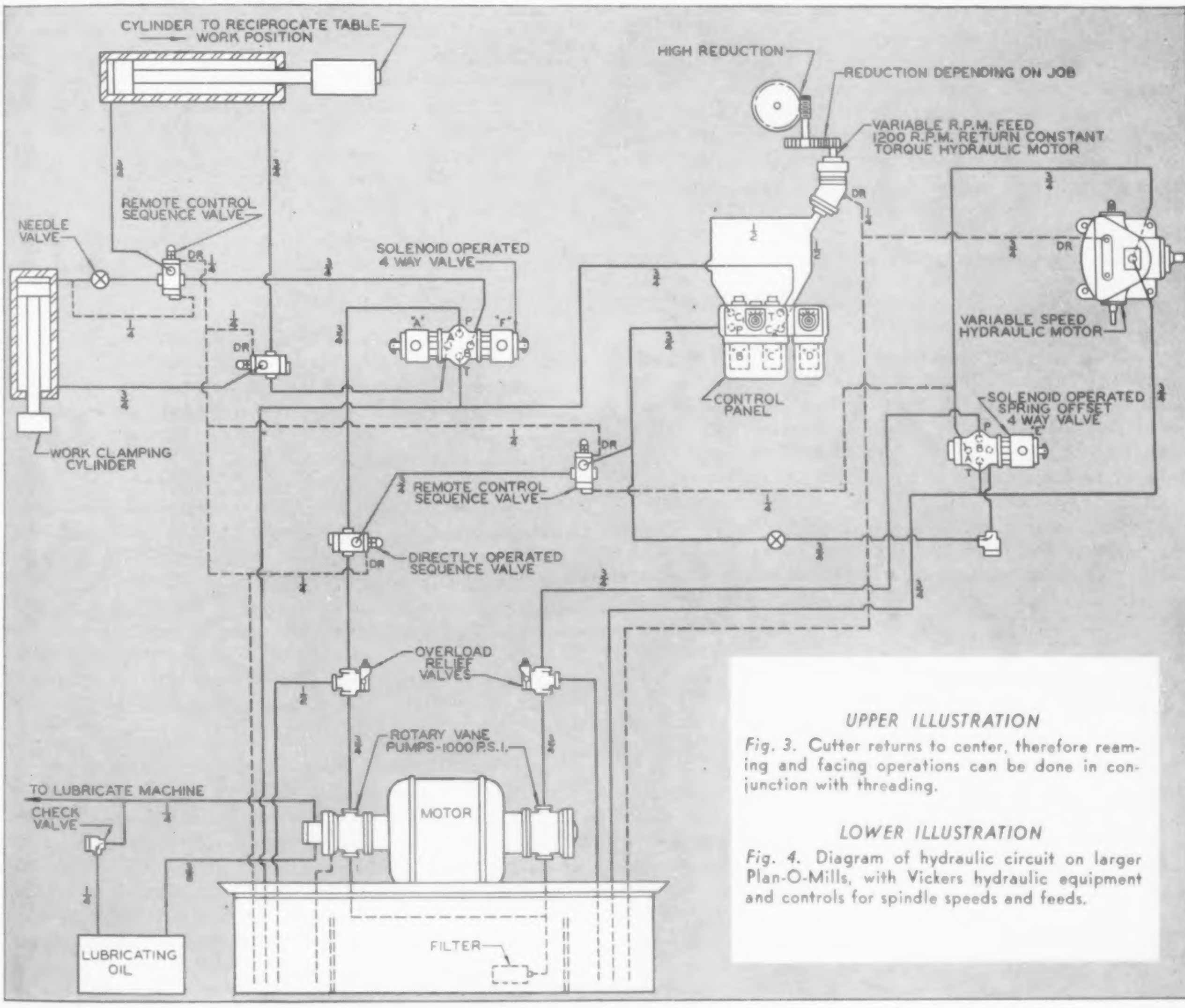


FIG. 2. Diagram of cutting spindle and quills.

cutter by moving the holding fixture forward. The majority of work on smaller machines does not require the sliding type of fixture, rather, the fixture may be rigidly mounted on the table of the machine, another factor in obtaining perfect alignment and freedom from vibration.

An advantage in having the cutter return to center is that Reaming and Facing operations, similar to that on the work piece shown, Fig. 3, can be done in conjunction with Threading. In this case the cutter spindle is left on dead center while the fixture is moved by a hydraulic cylinder over the Reamer and against the Facing Cutter. Note, here, the fast





UPPER ILLUSTRATION

Fig. 3. Cutter returns to center, therefore reaming and facing operations can be done in conjunction with threading.

LOWER ILLUSTRATION

Fig. 4. Diagram of hydraulic circuit on larger Plan-O-Mills, with Vickers hydraulic equipment and controls for spindle speeds and feeds.

and accurate method of locating and clamping the work piece by means of hydraulically operated female centers. The fixture is then backed up to position for Thread Milling and the Planetary Cycle started. The threading cutter, mounted on the same arbor, but in the clear during the reaming operation, now moves in to depth and produces the thread.

The Plan-O-Mill functions thru only three major moving parts:- the Outer Quill, mounted in the Head Stock and revolving on the same center line as the Fixture, the Inner Quill, and the Spindle.

The Inner Quill is driven by means of a worm and worm gear to eliminate any back lash, and revolves until the dog B, Fig. 2, contacts the adjustable stop C on the Outer Quill, at which time the Outer Quill (which has been held back by a brake) is forced to revolve with the Inner Quill. As the center line of the Outer Quill and the center line of the fixture and work coincide, the cutter must follow a circular path in the work.

Upon completing the cycle of feeding in to depth (which is controlled by the setting of the adjustable stop, making one revolution in the part plus approximately 1/8 of a revolution overlap), the feed mechanism reverses.

This reverse action first withdraws the cutter from the work, as the Inner Quill again revolves in the Outer Quill, until it picks up the stop C and continues back to its original starting point. The complete reverse cycle is necessary because the lead screw, in Planetary Milling, is not disengaged, because it is mounted directly on the Outer Quill with a large Bronze Nut mounted on the Head Stock itself.

Cuts to Full Depth First

Planetary Thread Milling presents exactly the same problems of speeds and feeds that occur in milling a series of thread forms in a flat piece, with the exception that before the forward feed can be started, the cutter must be fed in to depth. This action is considerably different than when feeding along the cut. Actual tests have shown it to consume five times the power to feed to depth than to feed progressively along the cut. This would limit the productivity of the machine due to the fact that the speed of operation would be limited by the feed-in. Smaller eccentricity is one solution, as the cutter would then feed in with a sweeping action. But, that limits the range of cutter sizes which can be used.

On the smaller Plan-O-Mill this is taken care of by the use of General Electric Thy-mo-trol Control. This panel, through the use of a transformer and electronic tubes, converts A.C. current to D.C. and allows a slow rate of feed in to depth, automatically changing to the proper feed at cutting speed and reversing at any desired rate—usually the time required for loading and unloading the work piece.

The large models use Vickers Hydraulic equipment to achieve the same result, using a hydraulic motor for driving the feed shaft and controlling the forward speeds and reversing by means of Solenoid Valves. This machine also uses a fluid motor for the Spindle drive, giving absolute coordination between spindle speeds and feeds. See diagram of hydraulic circuit, Fig. 4.

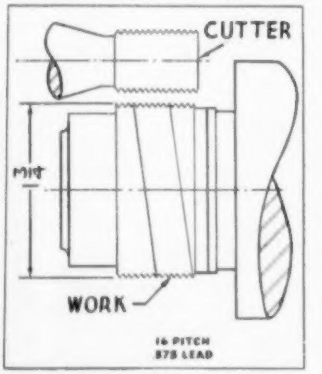


Fig. 5. American thread form, with cutter.

All planetary machines use a multiple type cutter, which is not a hob as sometimes called, but simply a series of annular cutters without lead. For V or American Std. threads, the tooth form is practically the same as that of the thread to be produced, being modified only to compensate for the hook angle to which the cutter is ground. An American thread form, with cutter, is shown in Fig. 5. Here, however, a sextuple 16 pitch thread is milled at one pass by the simple expedient of gearing the machine to .375 lead—i.e., .375 : .0625=6. The cutter is angular without lead. An internal, single thread is shown in Fig. 6. Note the counterbore in use which, with the faced end, can be done in the one set up as described for Fig. 3 above. For Acme Form Threads, however, where the side angles are less, the form of the cutter must be modified to take care of interference which results from the fact that an annular cutter is being fed along to produce a helix.

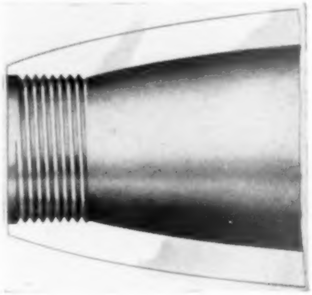


Fig. 6. Typical internal single thread.

The pitch of the teeth of the multiple cutter must be *exact*. Any error in groove spacing will produce a lap mark after the feed has traversed one revolution of the planetary motion.

The backoff of the cutter must be sufficient to clear the helix of the thread of the part being machined. This should not be less than 3 deg. and for the greater part not over 5 deg. Otherwise interference will take place. Cutters may be either form relieved, in the green state, or ground on the teeth flanks in the hardened condition. In either case, the cutters are sharpened by grinding the faces of the teeth, with or without rake.

Extreme care should be maintained to eliminate whip in the cutter arbor, particularly when milling threads in aluminum or soft brass. The cutter should be kept as close to the spindle as possible, and should run true or concentric with the spindle at not more than 0.0005″ total indicator run-out reading. A greater eccentricity will result in proportional inefficiency of the cutter and error in the work.

Types of Coolant Needed

Coolants are necessary for thread milling operations, and should be copiously supplied so as to help in washing away the chips. Good grades of cutting oils should be used for all steel work and malleable iron. One part thread cutting oil to five (5) parts machine oil is very good, however, oils used for chaser type threading operations are suitable. Brass and bronze can be milled with good mixtures of one part of lard oil to four parts of kerosene. One well known aircraft builder uses one part of a high sulphur (12 to 15 per cent) lard base oil mixed with 24 parts of kerosene.

External work can be accomplished by the use of a cutter head with blades facing inward. These blades are set annularly and the thread is produced exactly as with a standard cutter by the motion of the lead screw. However, clearances are much harder to maintain as the cutter has several teeth in contact at once and in many cases it is more economical to use an Offset Spindle head which uses a conventional cutter.

Tooth leading is one of the governing factors in thread milling and varies under different conditions, ranging from .002″ to .009″ and even in some materials as high as .015″ per tooth.

Factors Affecting Cutter Life

Cutter life, of course, is directly related to the number of teeth so that the largest cutter which can be used is the most efficient. Here, again, however, the helix angle of the thread enters into the picture, so that the smaller the cutter used, the better clearance conditions prevail.

For V or American Std. threads, a cutter of approximately two thirds (2/3) or three quarters (3/4), the size of the hole to be threaded works very well.

The imperfect thread at the start can be removed with the

thread milling cutter by what is known as the Higbee Cut. This is accomplished by a portion of the cutter being ground without form to the root diameter of the thread. As the cutter is fed along by the lead screw, this portion of the cutter removes the thread which has been cut to a point where a full thread is made.

The accompanying table gives a few typical examples of production on a variety of parts.

Advantages of Planetary Thread Milling

Summing up, the advantages of planetary thread milling are manifold. The work pieces are loaded and clamped in table mounted fixtures, especially advantageous when the parts are heavy. Clamping can be manual, or, accomplished hydraulically from the hydraulic system of the machine. There is ample clearance for loading, as fixtures can be retracted and advanced as well as moved laterally into the work. And, once set up and adjusted, the entire cycle of operation is automatic, enabling semi-skilled operators to turn out precision products at a speed hardly approachable by any other method of thread cutting. Finally, cutters are comparatively simple and long lived, the whole resulting in a marked economy of tooling combined with high production to precision standards.

Summary of Thread Milling Applications—Internal

Material	Part Name	Thread Details			Cutter Description			Speed Ft. Per Min.	Feed Per Tooth	Cycle Time in Minutes	Notes
		Diam.	Pitch	Type	Diam.	No. of Teeth	Hook				
Aluminum........	Cylinder head.....	6	10	V	5½	20	20°	518	0.0026	1	
Aluminum........	Cylinder head.....	5½	12	V	4⅝	20	R.I.T.*	630	0.0013	2½	
Aluminum........	Cylinder head.....	5¾	8	V	5¼	20	20°	825	0.0028	1	
Aluminum........	Cylinder head.....	6.12	10	Aero	5.58	20	20°	800	0.0030	—	
Steel R 28/32...	Thrust nut.........	2¾	16	V	2	12	—	110	0.0017	—	
Steel R 28/32...	Breech or tube extension........	4¾	6	Acme	3½	16	0.153	72	0.004	5	
Steel R 32......	Fuel injector nut....	15/16	16	V	⅝	5	5°	74	0.0024	1	
Steel R 33......	75 mm. shell.......	1.65	10	V	1¼	8	C.L.	103	0.0057	1	
Steel...........	4 in. illuminating shell............	1.701	14	V	1⅛	8	5°	105	0.0043	1	
Steel...........	Breech or tube extension........	2.50	4	Acme	1⅞	12	5°	93	0.0020	6	
Steel...........	Propeller hub......	6	8	Buttress	3⅞	16	5° (5° spiral)	67	0.0025	11¼	
Steel R 33......	Shell (shot)........	1.65	10	V	1 7/16	8	C.L.	84.5	0.0065	0.9	
Steel...........	90 mm. shell.......	2	12	N.S.I.**	1½	10	C.L.	79	0.0059	0.9	
Steel...........	3.75 in. shell.......	2	14	Whitworth	1½	10	C.L.	78	0.0063	1	
Steel...........	Flyweight.........	1	16	V	.730	6	C.L.	84	0.0021	1¼	
Steel Br. 240-270	Shell.............	⅝	16	L.H.	½	5	5°	89	0.0023	½	
Steel...........	Torpedo nut.......	4	20	N.S.I.**	2	12	5°	96	0.0028	3½	
Steel...........	57 mm. breech ring.	6.42	4	Acme	4.5	28	5°	70	0.0020	12	
Malleable iron...	Bearing lock nut....	2⅛	12	V	1½	12	C.L.	119	0.0054	1¼	700.800 psc. per gr.

Summary of Thread Milling Applications—External

Material	Part Name	Thread Diam.	Pitch	Type	Cutter Diam.	No. of Teeth	Hook	Speed Ft. Per Min.	Feed Per Tooth	Cycle Time in Minutes	Notes
Steel R 28-32 ..	Gun barrel........	1½	8	Acme	2½	12	5°	92	0.0016	2	
Steel...........	Gun barrel........	13/16	18	V	2¾	12	.195 (99 spiral)	100	0.0030	1	
Steel...........	Gun barrel........	1 7/16	8	V	2¾	12	12 (99 spiral)	87	0.0011	4½	
Steel...........	Gun barrel........	2½	4	Acme	2	12	10°	99	0.0009	6	
Steel...........	Spark plug........	18 mm. (0.705)	1.5 mm.	V	1¼	7	7°	180	0.0063	55 sec.	
Steel...........	Propeller blade....	4½	8	Buttr ess***	2½	12	5°	94	0.0017	9½	Two cuts in 19 min.

* R.I.T.—Remove imperfect thread and form seal. ** National Standard 1. *** Modified.
All Rockwell readings (R) are on the C scale. Br.=Brinell hardness.

Abstracts—45,000 Alien Patents

In view of the interest shown by American manufacturers in the 45,000 or so enemy owned patents seized by the Government, the publication of two sets of Abstracts or short descriptions of these patents seems particularly timely.

Developed by alien enemies at a cost of millions of dollars and millions of hours of work, they include many items of value in war work and for postwar use. Covering practically every field of manufacture, these patents are now available, under license, to American citizens at a fee of $15.00 per patent. The license covers the life of the patent.

The Abstracts have been classified and indexed as an aid to finding items of particular interest. Mechanical and Electrical Abstracts cover about 37,000 patents, chemical some 8,000. Both Abstracts consist of short descriptions and, in the case of mechanical and electrical devices, numerous illustrations are included.

The Electrical and Mechanical Abstracts come in sets of 4 volumes comprising about 4,000 pages with a 48-page index. The Chemical Abstracts come in 33 sections, and contain about 2,000 pages with a 400-page index. Each set sells for $25.00 and may be obtained from the Office of Alien Property Custodian, 311 Field Building, Chicago 3, Illinois.

Letters to the Editor . . .

Tops Previous Issues

Dear Editor:

I want to express my compliments to the editors of the *Tool Engineer* upon the February issue which has just reached me. Very frankly, it exceeds in general make-up and nature of the contents, any previous issues, in my opinion, and I feel that everyone connected with the enterprise should feel highly gratified with this initial copy.

I am going to this special effort of expressing myself because I have some idea of the headaches which have been involved in getting out this first edition, and I hope my little pat on the back will be some encouragement.

LARRY W. LANG,
National Tool Salvage Company
Detroit, Michigan

Finally Achieved

Dear Editor:

Congratulations on *The Tool Engineer!*

We have finally achieved a real tool engineering magazine. I looked it over yesterday and we have some real society news in it, and I like the set-up very much.

IRWIN F. HOLLAND

A Commendable Job

Dear Editor:

The members and officers of the Milwaukee Chapter No. 4 wish to take this opportunity to congratulate you and your staff on the very commendable job you have done on the first issue of *The Tool Engineer*. We have had many favorable comments on its contents and wish to extend our wishes for continued success with this publication.

FOSTER C. KOEHN,
Chairman,
Milwaukee Chapter No. 4

A Swell Job

Dear Editor:

Congratulations on a swell job. *The Tool Engineer* is today the leader in its field.

D. E. MCDONALD,
Member Northern New Jersey Chapter 14

Many Articles of Interest

Dear Editor:

I wish to express my satisfaction with the first issue of The Official Publication of A.S.T.E.

There are many articles of interest, such as chapter news, engineering ideas, promotions and articles of general interest which make interesting reading matter. I am sure I express the sentiments of many of the members of Chapter 9.

V. G. KESSLER,
Spicer Manufacturing Corp.
Toledo, Ohio

Values ASTE News Section

Dear Editor:

It was heart-warming for me to receive a long distance telephone call this morning from an advertiser who, from his point of view, thinks extremely well of the Society's first effort as publishers. Particular recommendation was pointed at the quality of the paper, the clarity of the photos, and the shading you have used in the line drawings in the Curtis article. What surprised me most was that this person—a non-member—spoke so highly of the Society's News Section. It is his feeling that now his advertising is going to a much larger organization than he originally visualized.

RAY H. MORRIS,
Immediate Past President
A.S.T.E.

Congratulations to All

Dear Editor:

Today I received the new *Tool Engineer* and I wish to compliment you and our officers for the splendid job done. Please convey my congratulations to our editorial staff.

HENRY DEBAER,
Chapter 30

Well Thought Out

Dear Editor:

May I ask you to accept my sincere congratulations on the fine job you have done on our new *Tool Engineer?* It is surely a well thought out piece of work. These articles are excellent and are of the type and kind we as tool engineers want. There is no doubt in my mind that it has been well received by all tool engineers.

E. A. DOOGAN, *Chapter 17*
Curtis-Wright Corporation
St. Louis, Missouri

A Fine Job

Dear Editor:

I would be very unappreciative of a fine job well done if I did not tender my sincere congratulations. There is bound to be an exceedingly favorable reaction from readers and advertisers alike—to say nothing of your competition.

HOWARD SPAULDING, *President*
Screw Machine Engineering
Rochester, New York

Fine Job Well Done

Dear Editor:

I want to compliment the editorial staff on the fine job it has done on the first issue of the *Tool Engineer*. As a member of the Society since 1935 when the publication was a rather amateurish affair, it is certainly a pleasure to see this fine magazine which is produced entirely by our own organization. My congratulations on a fine job well done.

W. H. SCHEER,
W. H. Scheer Production Tools
St. Louis, Missouri

Letters to the Editor . . .

Doubt Is Disbanded

Dear Editor:

I have just received my February issue of *The Tool Engineer*. There was a time, I must confess, I doubted the feasibility of a group of hairy eared tool engineers producing a first rate publication.

The current issue proves one salient point—*The Tool Engineer* must, from now on, be under the absolute control of the Society and I wish to congratulate the entire staff on the finest issue of *The Tool Engineer* to date and I have every reason to believe future issues will equal or better the present publication.

LT (J.G.) S. J. MATCHETT,
Bureau of Aeronautics Representative
Goodyear Aircraft Corporation
Akron, Ohio

Fine Looking Issue

Dear Editor:

I want to congratulate you on the very fine looking issue of *The Tool Engineer*.

C. S. BAUER,
Vice President and General Manager
The Iron Age

Highly Pleased

Dear Editor:

We are highly pleased with the good work and the constructive ideas, with illustrations, you offer not only to the trade, but also to the individual tool designer and operator.

Every clear illustration of the different methods used in the design of tools, attachments, and fixtures, is of great value to every manufacturer in improving his method of accomplishing better and more accurate work in less time, and at a lower cost. This will be especially important in the post-war period.

A. E. DRISSNER,
Vice President and Chief Engineer
The National Acme Company
Cleveland, Ohio

Congratulations

Dear Editor:

Congratulations to A.S.T.E. on a magnificent job.

R. E. CRAWFORD, *First Vice-Chairman,*
Toronto Chapter, A.S.T.E.
Canadian Machinery & Manufacturing News

A Logical Move

Dear Editor:

I received a couple of calls from local members congratulating us on the first issue of *The Tool Engineer*.

I have looked over my copy, and I would like to go on record of saying that while knowing very little of magazine publication, I think this first effort is a very excellent one, indeed, and I am more convinced than ever that taking over this magazine has been both the correct and logical move for us.

L. G. SINGER,
Assistant Secretary Treasurer,
American Society of Tool Engineers

Takes Personal Pride

Dear Editor:

Kindly allow us to compliment you on the "New Baby" February issue of *The Tool Engineer*.

The Article "Now It Must Be Told" was timely and decidedly important. Without a doubt many had the impression *The Tool Engineer* would be "no more"—we for one, I know.

As a Charter Member of ASTE No. 15 Philadelphia and among the early advertisers and an exhibitor at all ASTE Detroit Shows feel a very personal pride in this new move to bring *The Tool Engineer* under Society's wing in full.

H. CADAWALLADER, JR., *Pres.*
Standard Shop Equipment Co.
Philadelphia, Pennsylvania

A Very Fine Publication

Dear Editor:

You are to be congratulated in producing a very fine publication.

JOHN K. WILSON, *Advertising Manager*
Production Equipment, Chicago, Ill.

Of More Value

Dear Editor:

The February issue of *The Tool Engineer* has come to hand and kindly accept my sincere congratulations on the splendid work that has been done by you and your executives in arranging for the excellent publication.

I have received many complimentary remarks from the members of our Canadian Chapters regarding its arrangement and Engineering articles. Most members feel that the magazine will be of more value to them in the future, since it contains much more reading matter than the previous publications.

W. A. DAWSON,
Director of Regional No. 20
Hamilton, Ontario, Canada

It Is Tops

Dear Editor:

I received my new *Tool Engineer* and think it is tops!

HAROLD R. LAKEY,
Chapter 18
Dayton, Ohio

A Goal Is Attained

Dear Editor:

I have just received the copy of your "improved" *Tool Engineer* and wish to extend my congratulations to you for your efforts to attain such a satisfactory goal in editoral content. I am confident that this and future publications will be successful in the field of tool engineering and will add to the interest and informative material of the readers.

C. A. EIGABROADT, *Chief Draftsman*
American Meter Company, Inc.
Erie, Pennsylvania

By James C. Fuller

Magnesium Anodize Developed

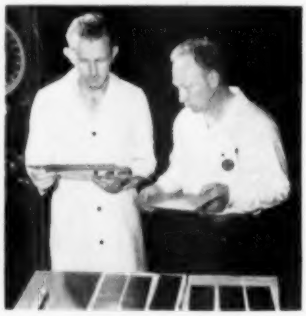
Protection of aircraft parts against salt spray and corrosion provided by new anodic treatment.

THE LONG felt need for a surface finish for magnesium alloys that will offer adequate protection from corrosion and abrasion and safeguard the use of the light metal in airplanes and household appliances has finally met with success.

Two youthful scientists, N. H. Simpson and Paul R. Cutter, chief chemist and research chemist, respectively, for Consolidated Vultee Aircraft Corporation's Fort Worth division, recently developed an anodize method for coating magnesium alloys which produces a surface film that inhibits corrosion, resists abrasion and forms a tight, integral bond with paints. This article explains the operation of their process and points out how they finally made the revolutionary discovery.

Since magnesium alloys are ⅓ lighter and equally as strong per unit weight as the much-used aluminum alloys, their use in aircraft structures, where lightness is even more desirable than strength, is favored by design engineers.

To take advantage of the now rapidly increasing production of the light metal and to increase the pay load of large planes now being developed, Consolidated Vultee Aircraft Corporation set up an extensive research program to ascertain the best means of processing and installing the new alloy.



***Paul R. Cutter* and *Norman H. Simpson* are respectively research chemist and chief chemist for Consolidated Vultee's Fort Worth Division. Cutter is a graduate of Panhandle A & M and Simpson is an alumnus of Utah State Agricultural College. Both men have had wide experience as industrial and research chemists.**

Simpson and Cutter were charged with the responsibility of finding a finish which would eliminate corrosion and abrasion and at the same time be compatible with paint.

Opens New Field for Magnesium

Their discovery has opened the gates to larger and more efficient aircraft. Magnesium, anodized by the Simpson-Cutter process, is now being used for dorsal fins, tail castings, trailing edges of wings, instrument panels, pilot seats, navigator seats and general furnishings. Engineers say that magnesium can be used in subsequent models of aircraft for skin, formed ribs, control surfaces, and stiffeners. The new process makes it possible for metal to be polished to a high luster and to be waxed. Magnesium can be anodized in any color and the finish is harder and more wear resistant than paint.

It is safe to assume that magnesium will be used extensively in the postwar manufacture of furniture, home appliances, etc.

However, as bare magnesium alloys are susceptible to corrosion under most atmospheric conditions, they must be properly protected before installation. Like aluminum, magnesium alloys cannot be successfully electro-plated with a non-corrosive metal. Magnesium differs somewhat from other metals in that paint alone will not necessarily form a corrosion inhibitor, unless the surface of the metal has previously been treated with some effective chemical or electro-chemical process. Such an effective surface finish must not only act as a corrosion inhibitor itself, but must furnish such a paint base that the corrosion inhibiting properties of the paint are fully utilized.

Factors Affecting Protective Treatments

Magnesium alloys are slightly softer than the other structural alloys, giving them superior machinability, but on the other hand, they are more susceptible to mechanical injury. Therefore, the value of any surface finish must necessarily be measured in terms of wear, or abrasion resistance, as well as its ability to inhibit corrosion.

Considerable testing by Simpson and Cutter of such standard chemical treatments as chrome pickle, acid dichromate, specification AN-M-12, type 1 and 3, revealed that although the finishes gave fair corrosion protection, they offered no resistance to abrasion and mechanical injury of the base metal. In fact, some finishes require as many as four coats of paint to insure proper insulation, thus increasing weight.

Controlled Uniform Coating Required

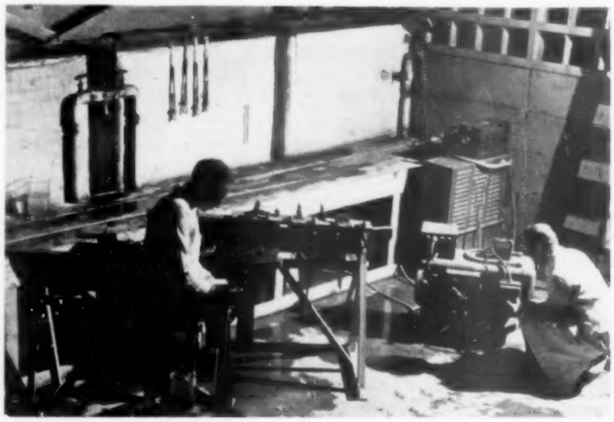
To produce such a finish, the research efforts were concentrated on developing a type of effective anodic process, whereby it was hoped that the extent of the surface finish could be controlled on the magnesium alloy parts by the amount of positive current applied.

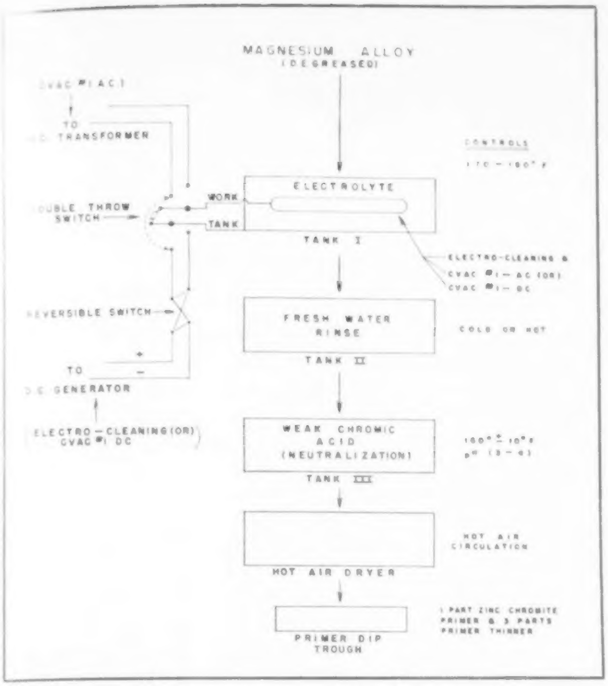
The natural atmospheric oxidation corrosion products of magnesium are carbonates, hydroxides and oxides, all of which are highly insoluble and known to be protective. Therefore, it seemed conceivable that an effective uniform coating might be placed on magnesium alloys by the use of a positive (oxidizing) current in the presence of alkaline solution of either hydroxides, oxides or a combination thereof.

The initial attempts with alkaline solutions produced anodic coatings on magnesium alloys which were 100 times as resistant to abrasion as the acid dichromate finish, but offered no advantages over the accepted dichromate finish so far as corrosion protection was concerned.

Extensive experiments were conducted to improve the corrosion factor by determining the most effective constituents, and their concentration, to be used in the alkaline electrolyte.

Only simple anodizing equipment is needed.





Flow chart for CVAC No. 1 AC and CVAC No. 1 DC magnesium finish processes.

AC or DC May Be Used

Simultaneously, a study to determine the proper controls was carried on, including type of current (AC or DC), current density, temperature of the electrolyte, and time of anodic treatment.

Experiments were conducted to develop an after treatment to properly neutralize the alkalinity of the anodic surface to insure good paint adhesion.

Since such anodic finishes, although they may appear smooth, are known to contain tiny microscopic pores which have the power of absorption, a study of the effect of all possible organic and inorganic sealers was made.

From this extensive search an anodic process was developed which produced a finish on magnesium alloys by either alternating or direct current that has proven superior to the finishes produced by the acid dichromate and chrome pickle treatments, specification AN-M-12, type 1 and 3, in resistance to both corrosion and abrasion.

The application of the new process is relatively simple.

After being properly degreased, the magnesium parts are placed into the alkaline electrolyte where they are made the cathode for electro-cleaning with a direct current. This removes the manufacturer's chrome pickle film and prepares the surface for the anodic finish. If DC current is to be employed in producing the new finish, the current is merely reversed, and the work made the anode. If the AC finish is desired, the magnesium parts are connected to a low voltage AC transformer after electro-cleaning.

Choice of Finishes Available

After anodizing, the parts are rinsed in hot water to remove excess caustic from the surface of the finish. The parts are then immersed in a warm, weak chromic acid solution for several minutes to properly neutralize any remaining alkalinity and to brighten the anodic surface. The parts are then dried and sealed by dipping them in a highly-thinned solution of zinc chromate or its equivalent.

Either AC or DC current may be used in applying the anodic process. The finishes are known as C.V.A.C. No. 1, AC; and C.V.A.C. No. 1, DC. The AC current is preferred on sheet material and gives a smooth, black finish on such alloys as AMC52S-H and AMC57S and a white finish on AM3S-O.

The DC current produces a smooth, green surface on AMC52S-H AMC57-H and is slightly more effective on castings.

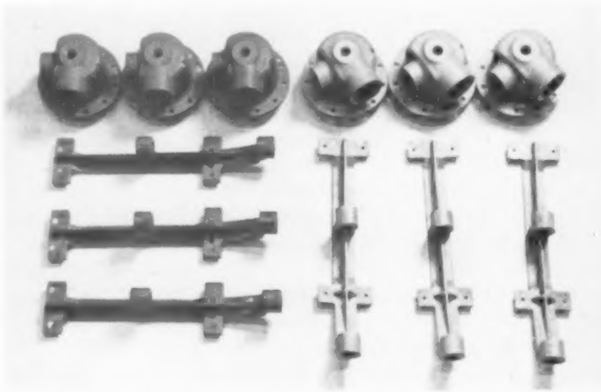
Simpson's and Cutter's attempts to increase the corrosion resistance of the new finish over that of the acid dichromate met with some degree of success by the use of certain inorganic additives to the electrolyte, high temperatures, and alternating current.

It was then observed that although the new finish was very smooth in appearance, like all anodic films, it had a powerful adsorption effect. Thus, when any possible non-water soluble material was placed on the surface of the anodically finished parts, it was immediately drawn within the oxidized film. Such material when uniformly applied to the C.V.A.C. No. 1, AC and DC finishes, greatly retarded the attack of salt spray corrosion; in some cases entirely eliminating it. This increase in corrosion resistance upon the application of similar organic sealers was not nearly as noticeable with the control finishes of chrome pickle and acid dichromate.

In the study of the organic sealers, one of the most effective materials tried was a thin dip coat of zinc chromate primer. As zinc chromate primer is normally applied in painting magnesium parts, its use as an organic sealer was considered most logical.

Since the effectiveness of any surface finish is not only based on its ability to inhibit corrosion itself, but also to provide such a paint base that the corrosion inhibiting properties of the paint are fully utilized, the superior corrosion protection derived from the new C.V.A.C. No. 1, AC and DC finishes became evident.

When specimens were given the above finishes and sealed with one coat of zinc chromate primer, the C.V.A.C. No. 1 finishes showed no progressive corrosion after 500 hours in the salt spray while the chrome pickle and acid dichromate

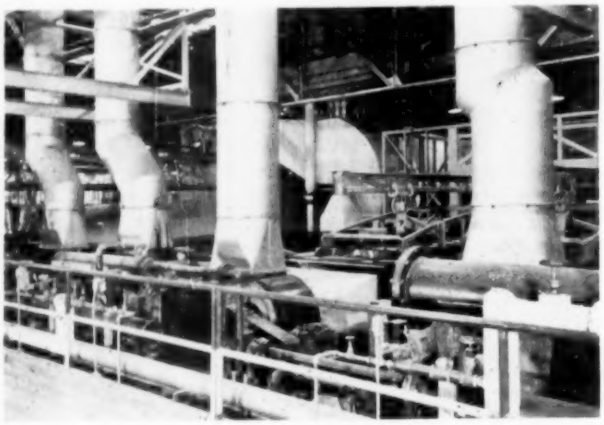


Above—Typical aircraft parts after anodizing (DC at left, AC at right).

Below—First step in anodizing process CVAC No. 1.

failed badly. Further test for 500 hours in salt spray also revealed that two coats of paint were sufficient to completely seal the new finishes from all corrosion while as many as four were necessary with the chrome pickle and acid dichromate.

Since the above findings were based on observation, an extensive test was conducted which employed 30 sets, 48 each, of finished magnesium tensile coupons. The tensile specimens were subjected to salt spray corrosion from 0 to



Second and third steps.

1,320 hours. When the various sets of tensile coupons were pulled and the ultimate tensile strength plotted against time in the salt spray, it was found that the C.V.A.C. No. 1, AC or DC finished alloys, plus one coat of zinc chromate primer retained their tensile strength through 1,320 hours while the primed acid dichromate showed signs of weakening much sooner.

Double Tests for Corrosion

Corrosion was also checked by placing the specimens to be tested in an accelerated corrosion bath made up on the basis of 11 grams of sodium chloride, 20 cc of three per cent hydrogen peroxide and 180 cc distilled water.

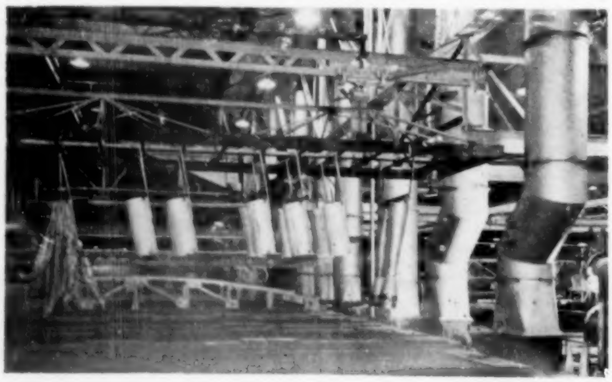
If the attack was expected to be heavy, the gases given off were collected and the degree of corrosion determined by calculating the weight of magnesium displaced equivalent to the volume of hydrogen gas given off to standard conditions.

This test showed that unprimed specimens treated with the new process were not progressively attacked but the acid dichromate and chrome pickle finishes were eventually destroyed after several hours' exposure to the above solution, leaving the magnesium metal exposed to progressive corrosion.

To check the wearability of the new C.V.A.C. No. 1, AC and DC finishes, the Taber Abraser was employed. This instrument was equipped with CS17F coarse calibrase wheels operated under 1000 gram wheel pressure.

In most cases, the chrome pickle and acid dichromate finishes failed after one or two revolutions while the C.V.A.C.

Third and fourth steps.



No. 1, AC and DC finishes withstood more than 1,000 revolutions.

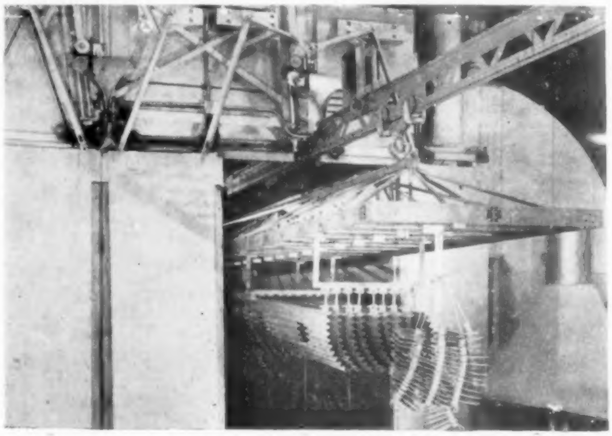
Tests Prove Durability

To check the accuracy of these observations, specimens were given 10, 100 and 1,000 wear revolutions, respectively and subjected to a 24-hour accelerated corrosion test as previously described. This test definitely established the point that 10 wear revolutions on the chrome pickle and acid dichromate finishes were more damaging than 1,000 on either the C.V.A.C. No. 1, AC or DC finishes.

Since these finishes have excellent resistance to abrasion, their application prior to forming, in order to protect the relatively soft metal from injury through handling, was considered plausible.

Salt spray tests were conducted on various methods of forming, such as dimpling, bending and rolling, on 90 degree bends. The new finish was compared to the manufacturers' chrome pickle finish. It was observed that with the addition of the zinc chromate primer as a sealer for C.V.A.C. No. 1, AC, applied either before or after (or both before and after), the various forming operations, more protection was maintained than by the conventional methods where the chrome pickle and acid dichromate finishes were applied after forming, plus one coat of zinc chromate primer.

In some instances, the finishes under discussion were exposed to 500 hours of artificial sunlight and rain in an



Final step in anodizing process.

accelerated weather machine, operated without filters and equipped with No. 12 and No. 22 sunshine copper electrodes. In this machine the specimens were sprayed with water hourly and subjected to intense ultra violet irradiation.

The (unprimed) chrome pickle finished specimens usually developed traces of corrosion after 100 hours, and the acid dichromate after 300 hours. The unsealed C.V.A.C. No. 1, AC and DC finishes revealed no corrosion after 500 hours' exposure to this test.

Galvanic corrosion can be very damaging to magnesium, inasmuch as it is the least noble of all structural alloys.

The anodic coating produced by the new progress is an excellent dielectric and has, accordingly, been found to act as an effective insulator in prohibiting galvanic corrosion when magnesium parts protected with the new finish are brought in contact with dissimilar metals.

The C.V.A.C. No. 1 finishes have also been found to offer more protection to salt spray corrosion than the chrome pickle or acid dichromate when in contact with dissimilar metals, which is probably the result of the greater depth of the dielectric film produced by the new finish. This should prove highly beneficial where magnesium alloys must be brought in contact with dissimilar metals, especially on the interior surfaces of airplanes where moisture may be trapped.

By O. W. Winter

Industry Views Tool Engineering Education

A.S.T.E. Program for Promotion of Tool Engineering Education Heartily Endorsed by Industrial Leaders

THE RAPID evolution of mass production and scientific manufacturing techniques over the past thirty years brought with it the development of a new field of engineering known as Tool Engineering.

***Otto W. Winter* is a past president of the Society (1943-44). He has held many other offices and has been a director almost continuously since the Society was founded. Graduating from Ohio State University in 1929 as a Bachelor of Industrial Engineering, he has held important positions with leading tool manufacturers in this country and Russia.**

Since the last war we have made tremendous world leading strides in the know-how of manufacturing. This progress has manifested itself in a great improvement in our living standards, in a transportation, communication, recreation and a home appliance equipment galaxy that awes the world. Still more recently we made it possible to catch up and surpass in two or three years what our enemies had been amassing for over ten years. This we did starting from virtually nothing or less when one considers all that had to be thrown out before war production could possibly begin.

Phenomenal Growth of A.S.T.E.

In 1932 a group of far sighted aggressive "Detroiters" working in the thick of this manufacturing evolution that was taking place, sensed the need for the professional distinction of those so engaged. Out of this the American Society of Tool Engineers was born. The society's phenomenal growth to over 18,000 in 15 years with 68 chapters in the United States and Canada amply attests to the vision and judgment of that original group.

A new branch of engineering was here. It comprised under the professional title of "Tool Engineer" the manufacturing executives and managers, the master mechanics, the tool designers and men in like capacities who were determining, selecting, designing, applying and developing the means of mass and interchangeable production.

As a means of studying and charting our professional course a national committee on education was formed in 1939. We knew that most of our membership had "come up the hard way" thru the "school of hard knocks." We knew that the knowledge we had acquired and developed could then only be obtained that way. There existed however an awareness that those aspects of our work in the nature of an art were rapidly evolving in a scientific direction, that manufacturing techniques were becoming increasingly complicated and that, as a result, it would some day be desirable or necessary to supplement the indispensable practical experience with formal technical education in an engineering college in the training of future tool engineers.

In the January 1942 issue of the society's journal "The Tool Engineer" there appeared an A.S.T.E. "Proposed College Course in Tool Engineering." It was hoped that alert institutions and individuals would show interest. Some did.

Some of the more alert schools had in the meantime installed degree courses in Industrial Engineering. Many of these courses served well to staff industry with managing executives in later years.

In the meantime we found ourselves at war and pitifully short of engineers in our field. In keeping with the times we included in our gigantic war training program courses in tool design and some labeled tool engineering. A.S.T.E. through its, since merged, Emergency Defense Training Committee did what it could to assist. In many places this effort was most successful.

Tool Designing vs. Tool Engineering

In February 1942 we surveyed all the engineering colleges engaged in the war training program, outlining to them our concept of the overall field of the profession of tool engineering. In answer to our questions we discovered that tool design was being taught under it's correct title but also labeled incorrectly as tool enginering. In some cases both subjects were listed with the tool engineering courses more or less hitting the high spots here and there. In most cases instructors from industry were preferred but often their knowledge of the subject was largely offset by their ineptness at teaching.

Most schools had been unable to find suitable teaching material and responded affirmatively to A.S.T.E.'s offer of assistance. Immediately we launched a review of all existing tool engineering literature. To our surprise and to some extent anticipated, a woeful lack of up to date and suitable for classroom text material was discovered. We thereupon redoubled our efforts in assisting such projects as that now conducted with the New York State Education Department on preparing tool design teaching material.

In June 1943 we wrote the same engineering colleges announcing the completion of our book review and our ability to make recommendations on the best available tool engineering literature. We also enclosed a reprint of our aforementioned "Proposed College Course in Tool Engineering."

Industry Wants Better Training

On the premise that engineering colleges, in the final analysis, will teach what industry wants, and that the student will want what industry wants, we set out to establish proof of what industry wanted.

Two thousand survey letters were sent to leading industrialists and engineers, the men who select and employ tool engineers. From this preferred list we have received over 500 replies. The replies to the questions speak for themselves although we have added some comments for further clarification.

The questions follow:

1. *Do you believe that the science of manufacturing has progressed to and reached a complexity and importance enough to warrant the recognition of Tool Engniecring as a separate and distinct branch of the Engineering profession?*

Ans. Yes 86% No 24%
This should be convincing enough.

2. *Do you relate tool engineering as a branch of mechanical engineering or industrial engineering or separate and distinct by itself?*

Ans. Separate 49% ? 4% Branch 47%
Of those considering that Tool Engineering could be considered a branch of anything the replies were split about equally between Industrial and Mechanical Engineering with the former having the edge.

3. *Recognizing that tool engineering proficiency in the past has had to be acquired primarily by practical experience, do you believe that valuable time could be saved in the typical self-made careers of most tool engineers by the application of modern scientific teaching and training methods?*

Ans. Yes 93% Undecided 4% No 3%
Out of those participating in this survey who were self-made successful men having never attended college this landslide answer is as unprejudiced and intelligent an answer as one could imagine. In view of this both college graduates and graduates of the school of hard knocks heartily agree.

4. *If so, should tool engineering be taught in fully-accredited engineering colleges giving engineering degrees, or in technical institutes that lie in the educational plane somewhere between high school and college?*

Ans. College 51% Both 22% Technical Institutes 27%
Need for both although a full-fledged tool engineer can best be trained in a full college course. The technical institute can do a good job of taking him part way.

5. *Would you consider graduation from a technical or trades high school a prerequisite to college tool engineering training?*

Ans. Yes 64% Undecided 2% No 34%
Desirable if available. Let's make technical and trades high schools more available.

6. *Would you consider serving a regular apprenticeship in industry as a prerequisite to any tool engineering training?*

Ans. No 42% Undecided 8% Yes 50%
An even split of opinion. Desirable but not essential.

7. *Would you consider graduation from a technical or trades high school a satisfactory substitute for a full industry apprentice term as a prerequisite to tool engineering training?*

Ans. Yes 44% Undecided 5% No 50%
Same as above. Either proper high school training or some industry training is highly desirable.

8. *Do you favor, for tool engineering training, the co-operative system of education where industrial experience and school training are combined in alternating periods?*

Ans. Yes 87% Undecided 4% No 9%
No question here. let's do something about it.

9. *Where co-operative training as such is not available, would you consider summer vacation work, inspection trips and college shops as an adequate substitute?*

Ans. Yes 50% Undecided 10% No 40%
If it can be done. With further enlightenment on how, this answer would be more in the affirmative.

10. *Do you believe training on equipment should proceed to manual proficiency or should the emphasis be on the know-how?*

Ans. Know How 66% Both 14% Manual Proficiency 20%
Know-how for an engineer.

11. *Recognizing that any graduate engineer, before reaching any substantial proficiency, must serve his practical "internship" of some four or five years, do you think this period would be longer for younger graduate tool engineers who have had proper pre-college training?*

Ans. No 91% Undecided 6% Yes 3%
It takes no longer to make a Tool Engineer, if started right.

12. *Do you think that four years spent in college, taking a qualified and basic course in tool engineering, would be time well invested? That is, could one learn more in college these four years than in industry?*

Ans. Yes 60% Undecided 16% No 24%
The ayes have it.

13. *If not, then would the college training enable one to progress more rapidly in the four or five years in industry after college with the result of a net gain with the same eight or nine years totally involved?*

Ans. Yes 88% Undecided 8% No 4%
Even with a negative vote on question No. 12, the answer to No. 13 settles the matter.

14. *Do you consider present college faculties competent to teach tool engineering subjects or do they need more actual experience themselves?*

Ans. Not Competent 87% ? 17% O.K. 4%
Here is an indication of the great indictment our engineering colleges are so guilty. Less money paid for football and more for faculty salaries would help. Even existing faculties could and would do much better if the proper incentive and interest were shown in the college. Otherwise get men from industry and pay them what they're worth. Keep abreast of the times and developments in industry.

15. *What subjects would you consider most important in a tool engineering course?*

The answer to this question sufficiently conformed to our Proposed College Tool Engineering Course as to convince us we are on the right track.

16. *Would you be willing to give us your opinion of a college course in tool engineering we have prepared? If so, we will send you a copy for review. If you've seen it (January 1942, issue of the "Tool Engineer") what do you think of it?*

Ans. Yes 95% No 5%
This should be evidence enough of the interest and thinking of the leaders of American industry. Their expressed willingness to give us further the benefit of their advice and opinions is gratefully accepted and further action will be taken.

The Education and Training Committee of A.S.T.E. is ready, anxious and able to assist anyone in the promotion of tool engineering education. Both thru our national setup and the structure of education and training committees in each of our 68 chapters we offer effective aid.

There are unmistakeable signs that engineering education in America is waking up. Are you among the alert ones?

Training Tool Engineers

What Colleges, Trade and Technical Schools, Industry, Government and A.S.T.E. Are Doing to Insure More and Better Trained Men

EXPANDING production for war, and later for peace, will require more and more tool engineers. Just to maintain present strength in this profession requires a considerable number of new men each year, to replace those lost through the draft, retirements, deaths, promotions and transfers to other types of work. We must do more than hold our own, however—we must provide for expansion.

As these lines are written, Allied military advances in Europe indicate that this phase of the war may soon be over —but we thought the same thing last fall, and see what happened! Our only safe course is to produce more and more materiel for the European theater until the Nazis definitely surrender, whether it be in a month or a year or even longer.

The same holds true for the war against Japan—we must produce more and more war products, including new types as rapidy as they can be developed or the need becomes apparent, until Japan is forced to quit. This increasing war production will need more and more tool engineers.

What about our postwar needs in this field? New materials, developed for war needs, will be used in many postwar products; new models and entirely new products, now planned or only partially developed, will be rushed into production; and large numbers of tool engineers will be needed to develop new production techniques and to tool up for all this new production.

Reconversion Requires Tool Engineering

Fears that the automotive industry, one of our largest and most progressive manufacturing groups, will need less tool engineers in the first postwar year seem groundless. While it is generally believed that the first postwar automobiles will be the 1942 models with some improvements, a vast amount of tool engineering will be needed before the industry can get back into production even on this basis. Many production machines have been worn out in war work, or converted to such an extent that it would be impractical to reconvert them to their former uses. Others have deteriorated in storage. Still others, modern in 1942, are obsolete today because of new developments in war production methods.

Many automobile factories have already ordered machine tool equipment on a "when, as and if" basis, and have made general plans for reconversion when it becomes possible. Even on the basis of this preliminary and incomplete planning, they have found that considerable retooling will be required.

Competition Insures Growth

Then what will happen if Ford's low-priced car, already promised, gets into early production? Or when Willys gets under way with the peace-time version of the jeep? Or if the Fisher Brothers, or Graham-Paige, or some other company unhampered by 1942 production equipment, announces new models radically improved over the face-lifted 1942 products of the established manufacturers? Some if not all of these developments are not only possible but probable. Any one of them will result in a lot of fast work on the part of competitive manufacturers to "keep up with the procession."

All indications therefore seem to point to a need for more and more tool engineers for war production today and for peacetime production after Victory.

A.S.T.E. Activities in This Field

Conscious of this ever growing need, the American Society of Tool Engineers has undertaken an extensive educational and promotional program with the dual purpose of attracting more men of the right type into this profession, and assuring them effective education and training. An aggressive National Committee on Education has been functioning for some time. Many Chapters have active educational committees. A general survey of the problem has been made. The groundwork has been laid, and the Society is now going ahead with a well rounded program which promises worth-while results.

Recently a questionnaire was sent to 1500 industrial leaders to get their thinking on various phases of the problem of recruiting and training tool engineers. While the returns to date are not conclusive, they show some interesting trends, which are summarized in the article "Industry Views Tool Engineering Education" elsewhere in this issue.

Where Will They Come From?

In planning an educational program such as this, it is important to consider the most likely sources from which the tool engineers of the future will be recruited, in order that the training methods may be fitted to their needs.

1. Judging from past experience, many tool engineers will continue to come up from the ranks, and will be largely self educated in the specialized features of this work. These men will be helped most by night schools, correspondence schools, factory in-training programs, refresher courses, and by attendance at Chapter meetings where timely educational papers are presented and discussion encouraged.

2. Apprenticeship in industry offers a fertile field for recruiting suitable young men for the tool engineering profession and for training them in the fundamentals of this work. Considerably neglected during the past ten or fifteen years, first because of the depression and later because of the mad scramble to speed up training of war workers only for specific jobs, apprenticeship is now being seriously considered and made an essential part of the program in many industries and factories.

Technical Training Not Enough

3. Technical and intermediate trade schools will probably furnish many tool engineers of the future, or at least men with sufficient basic training to permit their development into tool engineers with some further specialized training.

4. Engineering colleges are the fourth source for tool engineering training. College trained men now specializing in this branch of engineering are mostly men educated in mechanical, electrical or aeronautical engineering, because no specialized college courses in tool engineering have been available. One of the principal aims of the A.S.T.E. Educational Program is to foster the establishment of such specialized courses.

Technical training alone will not make good tool engineers, however. College education must be supplemented by, and preferably based upon, practical experience. As in other branches of engineering, and many other professions as well, the most successful men are those who can combine theory with practice.

War Experience as a Guide for Future Training

Success of intensified training programs for specialized war work has taught us many lessons in education, and may profoundly influence future educational and training methods. Four factors have contributed to the remarkable success of these war training programs:

1. Selection of qualified students.

2. Intensified study program, with non-essentials eliminated.

3. Adoption of the most modern instruction methods such as visual training by means of slide-films, motion pictures, large charts and photographic blow-ups, simplified drawings, jumbo models, etc.

4. Actual practice while learning.

A.S.T.E. Educational Program

Based on thorough study of the need for better and more wide-spread training and the best methods of providing it, the A.S.T.E. Educational Committee has developed a well-integrated program for recruiting and training men in the tool engineering profession. Important elements in this program are:

Promotion of apprenticeship courses in industry, with the co-operation and support of the Apprentice-Training Service, Bureau of Training, War Manpower Commission.

Promotion of apprentice branches in the various Chapters, subject to approval of the Board of Directors.

Sponsorship of an A.S.T.E. Certificate of Qualification for apprentices, after approval by the Board of Directors.

Promotion of special tool engineering courses in technical institutes and trade schools ranking between high schools and engineering colleges.

Promotion of specialized tool engineering courses as a separate branch of engineering, in colleges which grant degrees in engineering.

Co-operation with educational authorities in organizing, sponsoring, developing and promoting these educational activities.

"Selling" the idea of this specialized training to educational institutions and authorities, to industry and to the general public.

Special attention to the needs of apprentices, junior engineers and prospective entrants into this profession, in the preparation of programs for Chapter meetings.

Courses Now Being Organized

Rochester Institute of Technology, Rochester, N.Y., is now organizing a special course in tool engineering, and expects to announce full particulars in time for students entering next September. This will probably be the first such course to be offered by any such institution.

Ohio State University is seriously considering the addition of a tool engineering course and hopes to announce it in the near future. This university already grants degrees in production engineering as a specialized branch of the profession, and there is more technical and scientific matter in tool engineering than in the industrial branch.

University of Michigan and several others with well recognized engineering departments, as well as a number of strictly engineering colleges and technical schools, are also considering or definitely planning courses in tool engineering, but have some obstacles to overcome before such courses can be scheduled or announced. Growing demand for specialized training in this field will help to overcome the inertia now found in some quarters, and accelerate the development of tool engineering courses in many more colleges and technical schools.

Text-Book Material Available

Many text-books are already available on the subject of tool design and production engineering. One of the most practical and up to date is Volume I of "Elementary Jig and Fixture Design," by the New York State Education Department. This book has just recently been published, and Volume II is being reviewed for early publication. Future projects include:

1. Punch and Die Design
2. Gage Design
3. Cutting Tool Design
4. Plastic and Die Casting Design
5. Forging Dies
6. Advanced Jig and Fixture Design

This work is at present government-financed by the U.S. office of Education. It is hoped that this support will be continued after termination of the war. This work merits full A.S.T.E. professional support. Some form of finanical support or underwriting by the Society has also been suggested, with the likelihood that the project can be made self-supporting through the sale of literature.

The recently completed book survey, plus familiarity with other available tool engineering literature, places the A.S.T.E. in an excellent position to advise and assist any school desiring to teach tool engineering or any phase of this subject.

Comprehensive coverage of three important phases of the educational and training problem occurred at the semi-annual meeting at Syracuse, N. Y., October 12-14, in the form of three papers on "Education for Reality," by Dr. Mark Ellingson, president of Rochester Institute of Technology; "Training Tomorrow's Tool Engineer," by L. J. Fletcher, Director of Training, Caterpillar Tractor Co., Peoria, Illinois; and "Only Apprenticeship Builds Craftsmen," by Wm. F. Patterson, Director of Apprentice-Training Service, Bureau of Training, War Manpower Commission. Condensations of these three papers and highlights of the ensuing discussions follow.

Education For Reality

By Dr. Mark Ellingson

AT THE present time a revolution is going on in educational institutions. The war has brought to American education the kinds of problems which it has never faced before. New solutions are evolving. In some cases, the institutions themselves are not alert to the implications of the changes and I believe that the great path of American progress will pass those institutions by which do not open their minds and reexamine the programs of education which they are now offering.

***Dr. Mark Ellingson*, A.B., M.A., Ph.D., is president of Rochester (N.Y.) Institute of Technology. In addition to numerous civic and industrial activities in Rochester, he is prominent in many educational and engineering societies, including the American Association of School Administrators, National Education Association, and others.**

I am particularly concerned about this problem of education for reality, because we have just had a whole series of lessons on functional training. It seems to me that that is right down the alley of the A.S.T.E., because functional training, in the last analysis, is concerned with a program of education which is engineered to meet the needs of the individual, on the one hand, and the social structure on the other.

Education Has "Just Growed"

Education, by and large, just has not been built that way; it, like Topsy, has simply grown up over a long period of years and has adhered to traditions, many of which ought to have been discarded with earlier days.

I supppose that if you and I and other educators were to sit down and say, "What is the function of the American system of education, be it the elementary school, secondary school or the higher educational institution," we would come to the conclusion that we want to train good citizens and that has been the term that has been used so widely that it has almost no meaning. Until we define it more accurately, we simply can make no progress. It is like saying that a manufacturer ought to make or wants to make or is going to make automobiles and it all depends on the kind and the purpose and the function and the materials he is going to use and where they are going to be sold.

A Man Is Known by His Work

But over a long period of time, the schools have taken it upon themselves to train people who will fit in, in the first place, as wage earners, yet many institutions have completely neglected the problem of the wage earner. In our social structure, we have quite unconsciously given tremendous emphasis to this business of wage earning; that is, through the designation of people by their occupation. We do not define a man as being a Methodist or a Presbyterian, or as a Catholic or a Jew. We do not define him as being a member of a particular lodge. We do not define him by his physical characteristics. We do define the individual in accordance with the job that he holds, and so if you men perform sufficient miracles in war production, you are defined as tool engineers. That becomes, then, the major designation by which the social structure identifies the individual within its ranks.

By and large, educational institutions have tended to ignore the problems of occupation. That goes for our high schools, it goes particularly for our liberal arts colleges. It goes, to some extent, for our engineering schools. Although great progress has been made along the line, nowhere have we tried to identify the elements that are necessary in the job-earning of each individual and then build a streamlined or an engineered curriculum for the specific purposes of the individual concerned. I believe that the A.S.T.E. ought to be perhaps more sympathetic to this point of view than almost anyone I know, because you know the difficulties that would be attendant to the manufacturing of any product if you did not know the use to which it was going to be put.

I know all of the answers that educators give to this problem. The engineering colleges, for example, have said, "We don't know where in the enginering field this individual is going to go. Therefore, we have got to give him broad basic training." The liberal arts colleges say, "We don't know exactly where this individual is going to go, so we will give him training or education that is even broader than that given by the engineering colleges. We will sharpen his mind; we will turn him out an individual who can go into the factory, into industry, with some kind of occupation and make his own way."

The high schools say, "We must train all of the people for the hundreds of occupational classifications; therefore, there is not much that we can do."

A.S.T.E. Has Big Responsibility

You members of the A.S.T.E. have a very important responsibility. In the first place, you are in the process of becoming one of the most powerful engineering agencies in the United States. You have had a phenomenal growth in the few years you have been in existence and you have now reached a place where you ought to begin to take an active part in the control of, first, the selection of the young men who go into your field and, second, the kind and quality of training which is going to be given to them.

I therefore want to take this opportunity to commend you and your Educational Committee for what you have already done. I suppose that every one of the members of this Society knows that your Educational Committee canvassed colleges and universities throughout the United States, trying to find institutions which would inaugurate full-fledged courses for tool engineers, and I suppose that you know, too, the rebuffs that you have suffered, the fact that the traditional engineering colleges have said, "We don't know whether there is quite enough science involved in this particular program to make it worthwhile. We don't know whether it is a real engineering field or not."

Engineered Training for Tool Engineers

I disagree very sharply with those institutions, and as a result of that, we at the Institute in Rochester have undertaken, with your collaboration, with your help, a program in tool engineering which is going to be an engineered program for tool engineers. This program in its details has not as yet been submitted to our own Board of Directors, but that will be done in the near future and we expect to have the offerings listed in our catalog for the fall of 1945 and accept students at that time.

I should like to tell you just a little bit about the way we visualize this project being carried out. We visualize, in the first place, that any education needs to be engineered to meet the needs, on the one hand, of the individual concerned, and on the other hand, of the social structure. Therefore, if we were to follow the procedures which you men have worked out so well in your own industry, we would say, "All right,

what is the purpose? What does the tool engineer do? What are his functions? What are the kinds of activities that he carries out?" We have had a very splendid local committee in Rochester working on that until we have begun to isolate and identify all the activities that tool engineers carry out. That corresponds, in my mind, to the purposes, the qualities and characteristics of a product which might be manufactured, just as you know the purpose and the characteristics which were wanted in the finished product before you could set up a manufacturing process for it.

How Much Mathematics Needed?

Let me make one or two specific illustrations. We have made a number of analyses of the amount of mathematics that is used by mechanical engineers, chemical engineers, electrical engineers, civil engineers, tool engineers. We find that the amount of mathematics that is given in the traditional college and university engineering course is far more than is used in 95 per cent of the cases. Those of you who came through engineering colleges will bear me out.

But the colleges and universities say, " We don't know what a man ought to do. We don't know where he is going, so we will give him all of this mathematics."

The traditional institutions and the Society for the Promotion of Engineering Education say, "We have to give so much general material that we are going to have to add another year to cover specialized kinds of information that our engineers simply must have if they are going to be of use when they go out into the field." So they are talking about five and six-year programs and even seven-year programs for engineers.

I think we ought to re-examine our whole structure of engineering education and say, "Let's design engineering education to the functions for which engineers are used." That would mean we might eliminate two-thirds of the mathematics. It might mean that we would eliminate considerable of the mechanics and a whole series of things, and we would begin to build in with other practical, scientific and usable materials that would make the individual coming out of our institutions a person who really knew what it was all about and who could fit in with a much shorter apprenticeship than is now required of men coming out of engineering colleges.

This is merely the applying to engineering education the processes and practices and doctrines which engineers themselves preach when they go out into industry.

I suppose there are a great many reasons as to why this has not been done almost universally. One of the first of these is the traditions that surround academic institutions. Most of them have grown up over a long period of years. They have been charged with the responsibility of maintaining the residue of the experience, so that when the man in mathematics gets all the mathematics that has been accumulated over the ages, he feels he cannot do a good job in mathematics except as he uses the major part of it. There are a few individuals who are highly specialized in mathematics who need all they can get. Therefore they, too, put the pressure onto these institutions.

Education Should be Modernized

Our colleges and universities, our educational system as a whole, is simply going to come apart at the seams, unless it re-examines the functional nature of its program, re-examines its courses in the light of the needs, again, of the individual on the one hand and of the place where he is going to fit in society on the other. I believe that you people have been very wise in setting up your educational committees in working on these problems.

The doctors, the lawyers, almost every professional group, have taken an interest in the curricula which are provided for advancement within their own professions. You gentlemen just now are beginning to take that keen interest, and I think that is a constructive step and one on which you are to be congratulated.

We are starting out, in the first place, with a pretty clear picture of what the tool engineer is, of the kinds of jobs that surround that field, of the kinds of jobs through which an individual has to move in order to become a tool engineer. This gives us what we call in educational language a cluster or a constellation of jobs with the tool engineer at the center. A whole series of jobs surround that, jobs coming up through which young men can progress. When we have that we have a very important counselling and guidance document which we can use with people who are interested in this field.

There is one other aspect of this program I want to mention: the co-operative work aspect of it. We believe that while the philosophers have long been searching for a moral equivalent for war, and we hope that in the name of heaven they sometime find it, we also believe that there is no moral equivalent for work and that that is a kind of education. You men in the A.S.T.E. are exemplifications of it, because that is the way most of you came up. We believe there is no substitute for work experience; therefore, the program in tool engineering, which we are proposing and which we believe we are engineering, is going to be built upon the thesis that an individual will work in school part time and will go to work part time, so we are going to be calling upon you to help us in this educational process.

Combine Study and Experience

The individual will go to school ten weeks, work ten weeks, come back to school ten weeks, go to work, in alternate periods, get the benefit of the kinds of experience that exist only in industry, that simply cannot exist in the school, so you people have a responsibility there.

The program which we are now in the process of setting up is designed primarily for young high school graduates who are going to enter into this field with the idea that they will make their career in tool engineering. We believe that with your help the program will be a good one.

With that much as a general outline, I should like to examine two or three concepts that seem to me to be of particular importance if we are going to do a real job on this whole educational system. Parenthetically, I might say that I don't hold out much hope that traditional colleges and universities will be very much interested in this, because it is too close to the productive work of the world and most of them like to feel they are at least two or three steps removed from the actual work of the world, and the closest they come is when they exercise supervisory responsibilities over the labors of others.

Concept No. 1: that the values that come from it are so important that every American child ought to have the benefit of work experience irrespective of the kind of field in which he is going.

One hundred or one hundred fifty years ago the problems of occupation, being relatively simple, gave every child an opportunity to participate in the productive work of the world. Those times have changed. Centralization, specialization, urbanization, industrialization, all of these other events that have moved upon us, have given us a social structure in which the young men and women of today do not have as much opportunity to participate in work as they ought to have.

I think the time is coming, when every American child is going to have an opportunity to work in industry for pay. I have been accused of being in favor of child labor. I want to disabuse your minds of that. I think this has to be the kind of work experience which is good for the child, but by the

the individual gets through high school there is the real ... that work plays.

Concept No. 2: Under a plan which involves specialization, ... must of necessity be a sound counselling and guidance ... We can no longer afford in this nation to go on educating people with the kind of education which has no usefulness for either the individual or society. Education is costly, it is tremendously expensive. We have a great educational plant scattered throughout this entire land, but we need to sharpen our techniques just a little and see that we are doing a better counselling job. That means, on the one hand, that we know or that we develop the techniques of finding out from each individual what his potentialities are. Then we need to have individuals doing the counselling who know what actually is going on in industry. I believe every high school, college, and university teacher in the United States ought to spend at least one year out of every five working in some kind of industrial plant. Of course, I realize that would be hard on industry, but you fellows can take an awful lot. You could put up with that for the benefit that would come to the American school system.

Trade Training Must Be Broadened

I am not concerned with narrow, pre-defined trade training. There is a place for trade training, but there is no place, I think, for narrowly pre-defined trade training of any kind. You men have responsibilities, first, as wage earners and as occupationally competent people. If you did not perform those duties well, you would have relatively little place in any community in which you might find yourselves, so I say that is first. But after you have performed those jobs well, then you fit in. You are members of the communities in which you live. You are voters. You have homes and families and you are members of churches. You have all of these other responsibilities, and I believe that school has a responsibility for that, too.

That ties in, of course, with the fact that we do not train for a single, narrowly defined job, but we train for a cluster or constellation of jobs.

Concept No. 3: Finally, I should like to point out that education is a continuing process. You men know the rapidity with which industrial change takes place, because in many cases you are the people who are responsible for that change. That means, therefore, that you, the worker, the manager, every individual, must use all kinds of devices to keep yourself in constant training for the new things that lie ahead. If you fail to do that, then you become dated just as the 1910 automobile is dated, by your habits of thinking. That means that you must keep up with your professional journals, with your professional societies and their meetings, so that you are constantly pushing against the boundaries of new frontiers and bringing up new things. That, of course, is one of the things that many educational institutions have failed to see. They have looked upon their educational processes as one in which they give a broad basic training, and then sign off with respect to their own responsibilities. The individual is on his own.

I believe that no educational institution can take that position. You, in your own communities, ought to be working with the colleges, with the high schools, to see to it that education is available to every individual at all ages and at every level of responsibility or work.

There is one other general criticism which I level at our educational system. That is that in education we have become too much enamored of this whole business of degrees. At the Institute we grant no degrees. Seventeen hundred educational institutions in the United States grant degrees, and we say, "If you want a degree go to one of the seventeen hundred, but we have a kind of training that we believe is of greater usefulness."

Degrees vs. "Know-How"

You have run across this degree business; you have run across the fact that engineering colleges say you cannot get a degree except as you take these things, these particular items in many cases having no relationship to what the individual wants to do. But we have built up an iron-clad caste system with respect to degrees. I predict that is going to fall apart at the seams as well, and the time is going to come back when American industry and American business will look at an individual and say, "What can you do and how well can you do it?" and on the result of the answer to those questions that individual is placed within the industry and given an opportunity to show what he can do.

In some cases you people are forcing these changes, and I look forward to a day when there will be more constructive education pushed in, urged upon educational institutions by professional societies such as yours, who take an active part in the development of teaching, the development of educational programs, and who force upon educational institutions the same engineering procedures which you use in your daily work, so that they may have the benefit of scientific thinking and scientific research about their own programs.

Training Tomorrow's Tool Engineers

by L. J. Fletcher

MOST professions have emerged from the skilled craftsmen's stage (where the individual tends to keep to himself the arts and abilities which he has developed) into professional activity where the members are concerned with passing on to their colleagues that which they have discovered and proved. When a new profession develops, there are certain advantages gained by those in it but there are also certain responsibilities. One of these responsibilities has to do with the proper training and development of those who enter the profession. In fact, the future of any profession or craft depends entirely upon those who are entering today.

***L. J. Fletcher*, director of training, Caterpillar Tractor Co., Peoria, Ill., has been with that company since 1927. An engineering graduate of Iowa State College, 1915, he is a member of A.S.T.E. and the Peoria Chapter, and of the Council of the Society for the Promotion of Engineering Education.**

The members of the American Society of Tool Engineers must be concerned with those younger members of their profession or, even more important, those younger men who are now laying the foundation on which to build their careers as tool engineers. These young men may be in apprentice courses, may be self-taught, or may transfer from other types of engineering. The type of guidance which should be afforded these young men, while principally technical, is mainly of value where it is sympathetic and constructive. It is far better to build a consciousness of high standards and ethics in a profession through guidance in the early years than through regulation in later years.

Experience and Study Both Needed

In talking to tool engineers, I have frequently asked the question, "What do you consider to be the best way for a

man to get started in this field?" With few exceptions, the answer has been, "Experience in a production shop with careful study of the fundamentals or sciences closely related to his work." These men frequently point out examples of men engaged in the field of tool engineering who have failed to master, along the way, the essential knowledge on which their work is based; for example, resolution of forces, deflection, properties of metals, inertia, kinetic energy and the like. At the same time men have entered this field well versed in technical theory but yet failed to advance because they lacked shop experience which brings about practical concepts of deflection, for example, as reflected in the design necessary to produce uniform accuracy and good finish.

If you will examine a good machinist apprentice course in which shop experience includes work on production machines, in the tool room, and in tool design together with good related study in shop mathematics, physics, drafting, metallurgy, heat treatment, production planning and the like, it will be apparent that this type of training furnishes an excellent foundation on which to build a professional career in tool engineering. With or following such training should be included subjects dealing with time study, motion economy and all those various activities which tend to make the production shop more efficient.

Following such foundation there then comes the period of further development which usually consists of more complete knowledge of those fundamentals not yet fully mastered. Here, I refer to further study in the field of mathematics to make this science a real useful and dependable tool; and a restudy of physics and all of its phases so that such subjects as hydraulics, electrical controls, behavior of metals and the like may be really understood.

Education Must Be Earned

At this point, let me say that no one ever *received* an education. Learning is not something which can be lifted off from a platter held in the hands of a college faculty. Every educated person educated himself regardless of the means provided. A tool engineer, therefore, can secure this further training in many ways such as in night school, through cooperative engineering courses, courses offered by factory training departments or through engineering extension courses handled partially by correspondence. All of these require real study and the ability to stay with the job until it is completed. There are few professions where those who claim to be a practicing member of that profession require a better or more complete combination of working experience and theoretical training than that of the tool engineer.

It is my principal purpose in presenting this paper to call your attention to the responsibility of the local chapters of the American Society of Tool Engineers to what may be called the youngsters of this Society and more especially to apprentices in those courses which furnish this foundation experience and knowledge. Chapters of this Society are now established in practically all of the machine building centers of this country. The vital nature of this profession to the very existence of this country has been amply proved by your great contribution to our war production. However, your contributions to our peacetime economy are of even greater importance for our continued welfare and high employment. The job of bringing up the youngsters of the profession is one which merits a large portion of the attention of the Society and its local Chapters.

In most machine building companies where there is established a machinist apprentice course much attention is given to tool making and, to a degree, to tool design, production planning and the like. Of all the professional or engineering societies who might have an interest in these young men during their apprentice years, the A.S.T.E. is perhaps the most interested. A number of the older engineering societies have found most practicable the plan of student branches in the engineering colleges, for example, the student branches of A.S.M.E., A.S.C.E., and the like. These student branches elect their own officers, prepare their own programs, receive some guidance from the parent society but are largely training grounds for young men just beginning to learn technical or professional procedure, viewpoints and behavior. In many of the apprentice courses an apprentice branch of A.S.T.E. set up on a similar basis would be of great value.

Apprentice Branches at Company Level

I suggest that if these branches are established they be by companies rather than by areas. The apprentice group in each company is a closely knit organization with a reasonably common objective and is easily handled as a unit. A committee of A.S.T.E. members, from that plant, could be appointed by the chapter as a guidance or advisory committee to the A.S.T.E. apprentice branch. The branch would operate under a constitution and set of by-laws supplied principally by the parent society with certain leeway afforded each local branch. The parent society would insure that the meetings be devoted to presentation and discussion of subjects which come within the general field of tool engineering or production. This might not be strictly true depending somewhat upon local conditions. However, the club would be formed for professional development at the student level.

The advantage of such a branch over an apprentice organization running on its own is the opportunity it gives the older members of A.S.T.E. to advise with the apprentices yet encourage them to handle their own affairs just as far as possible. The relationship between the local chapter of A.S.T.E. and the apprentices would be considered as strictly technical and thus be removed from any feeling that it was company sponsored.

Some plan should be arranged to provide student members with copies of the TOOL ENGINEER, perhaps arrange a student branch button and on occasion have the apprentice members make reports at local A.S.T.E. Chapter meetings.

Some years ago the apprentices of my Company discussed with me their experiences in attending local meetings of the various engineering societies. They stated that while they understood quite a bit of most of the discussion they did not feel like entering into the question period following the papers because their questions were generally more elementary or at least they felt that they should be seen and not heard. In addition, it is likely the speakers themselves would have handled their subjects differently if they were speaking to the younger group. This later resulted in the forming of a technical society by the apprentices. They arranged for their own speakers and carried on their own meetings. Such Societies depend for their effectiveness entirely upon the type of leadership available from year to year within the group. When members finish their apprentice course, there is no logical step for them to take leading them into the work of an existing engineering group.

A.S.T.E. Best Fits Apprentice Needs

It is, of course, entirely possible that in some plants the apprentices might wish to set up a branch affiliated with some engineering Society other than the A.S.T.E. However, in many of our mass production plants, it is my observation that the program of the A.S.T.E. well fits the needs of the machinist, toolmaking and tool designing apprentices.

It is, therefore, recommended that this Society carefully investigate this proposition. Start with a few apprentice branches well established and carefully guided. Experience gained with these branches may be used to help develop a well-rounded, more general program in the years ahead. Remember, no structure is better than its foundation.

Only Apprenticeship Builds Craftsmen by Wm. F. Patterson

NEVER in the history of our nation has there been the need for training of industrial crafstmen that exists today. The war interrupted and curtailed our national apprenticeship program just as its benefits were beginning to be realized. Our statistical studies show that in many trades, including the machine trades, our craftsmen groups have been aging rapidly. Time, aided and abetted by long hours of work and war anxiety, is taking a heavy toll. We are coming to a period where a high degree of skill is essential not only to its possessor but to the establishment in which he works.

***William F. Patterson*, director of Apprentice Training Service, War Manpower Commission, Washington, D.C., attended the University of Wisconsin in 1916-20 and later completed post graduate work there in labor economics, psychology and education. He has had many years of experience in apprenticeship training and placement work.**

I do not mean to imply that the man with knowledge and skill has not been a priceless asset both in war production and in the armed forces, but there are essential differences in production for war and production for peace.

To mention only one difference seems sufficient to point up the problem: The war must be won regardless of costs, but the peacetime operator must weigh each action in relation to competitive costs if he is to stay in business.

Prior to the first World War, it was no uncommon thing for management to attempt to meet the competitive cost problem through wage reductions, the theory being that by paying less in wages a particular enterprise would get the jump on its competitor. But this has never been a profitable measure for management and certainly not for the workers.

In that era of wage and price cutting little thought was given to such things as personnel departments, labor relations, efficient plant layout, good lighting, sanitation, safety and training.

New Viewpoint in Industry

Now management has an entirely different idea. It knows, for one thing, that the workers are also customers. It knows that one of its big functions is to get things done by and through people. It knows, for example, that there is an important and profitable use for tool engineers and designers.

And I am happy to report to you that management has learned to talk and think of training in terms of an investment—in terms of quantity and quality of production. Up until recently we have heard entirely too much of the *cost* of training. Today however, more and more top managers are asking the question "how much is it costing us *not* to maintain a sound training program?"

It seems to me we have to be realistic about the problem. If we are to capture and cultivate the interest of the top man in an activity we are fostering, we must show him that there is value in it, that the project will materially contribute to the advancement of the whole business enterprise.

I can say to you that we need craftsmen. You will agree with me because craftsmen are needed to apply successfully your work. But how are we to convert this need into a dollars and cents value so that the men who hold the purse strings will be convinced they must take action so that craftsmen will result?

Throughout this past year we have been discussing this matter with people in industry. We have been trying to get facts and figures. We know that apprenticeship pays. We can get a vast quantity of testimonials that apprenticeship pays, that other forms of in-plant training pay, but when we try to pin those testimonials down in terms of an accountant's cold hard figures we usually find that they are not there.

Recently we have published a small pamphlet entitled, "Evaluating Apprentices and Apprentice Record Cards." This pamphlet endeavors to set forth elements to be taken into consideration in determining what dollar value the apprentice returns to his employer as against the wages paid him and the various elements which may fairly be charged against him.

More Replacements Needed in Industry

Consider the machine tool craftsmanship situation for a moment. You are particularly interested in this group. Where are your craftsmen coming from? At one time a considerable proportion came from the apprenticeship systems of other countries, but census figures show a sharp drop in this foreign source. The 1940 census figures in this matter are not available, but I feel reasonably certain that the trend favoring employment of American-born continues even more sharply. But there is another factor which must be considered. That is the age of the present skilled labor force. The median age of the machine trades group in 1940 was 38.1 years. In 1930 it was 34.6 years. This shift of 3.5 years in a pre-war decade strongly suggests that we are not training a sufficient number of craftsmen to maintain a satisfactory balance both as to age and quantity.

On the other hand, all evidence points to the fact that a much larger number of workers are entering the skilled trades than are trained through apprenticeship. Certainly they have not been coming in through the apprenticeship you and I know—a well-organized and supervised training program.

The promotion and development of a national apprenticeship program which will bring to all young workers in a skilled trade the advantages of apprenticeship is an enormous job. It is not just the job of Apprentice-Training Service, it is primarily the job of industry. Your organization can be one of the most influential in the whole development. You know the need for craftsmen. You know how craftsmen are trained and you have access to large numbers of people whose support must be had if the program is to do the job.

There is another problem or series of problems which are worth your consideration. The war has put its stamp on apprenticeship. The needs of the armed forces for young men in great numbers have depleted the ranks of the younger craftsmen and apprentices. Thousands upon thousands of them are in the military services where their skill and training are being put to good use.

Armed Forces Gain, Industry Loses

While the services gained by the induction of these apprentices, the industry apprenticeship programs lost them. And this loss could not be made up. At the very time that most of them were being drafted, the Selective Training and Service Act was amended to take into the services the eighteen and nineteen year old boys. This has resulted in a greatly reduced number of apprentices in training to become craftsmen.

I am happy to say to you that our apprenticeship joint committees and apprentice supervisors did not give up. They knew that it is about as difficult to revive a program as it is to start it. Further, they knew that in many trades the war work and the later conversion to peace operations could

not be carried on efficiently without real craftsmen. In a great many cases the work force was combed to see if there were some draft invulnerable men who had the qualifications and ambition to learn all of a skilled trade. This method did serve a real purpose, both to the men selected and to the war effort. A number of men classified as 4-F were given the opportunity to learn a trade.

A number of apprenticeship programs were set up for 16-year old boys which required continuance of high school to completion. These have been successful but of course it was necessary that the employer understand that the chances were good that these apprentices would be required in the military service upon reaching the age of 18.

Shortly after Pearl Harbor, the Apprentice-Training Service assisted in setting up its first program to provide craft skills to veterans. We did that for two reasons: One, because we saw the probability of depletion of apprentice ranks. And two, because we felt that the men, particularly those injured in the nation's service, deserved the best possible foundation for industrial success—the only real training for craftsmanship, apprenticeship.

Apprenticeship Programs for Veterans

Our field staff began talking to employers and labor unions regarding the possibility of giving veterans an opportunity to become craftsmen. The idea took hold. Management and labor both knew that there would be some differences in their normal apprenticeship procedure in taking on veterans. For example, there was the question of age. Most apprenticeship programs set a minimum age and a good many set a maximum age. The minimum was no problem and the maximum age limitation was a smaller problem than it might have been had not most of the apprenticeship programs been set up with a qualifying clause in the age requirement to permit the employment of older persons who had had experience or who showed unusual qualifications.

Even with this flexibility, most joint apprenticeship committees have found that further action is desirable to take care of veterans. A very high percentage of the programs have been amended specifically to permit the employment of veterans as apprentices. In some cases where a flat maximum age limitation has been established, these committees are taking the position that the veteran, for apprenticeship, does not accumulate age while in the nation's service.

A number of principles have been established with regard to encouraging veterans to become craftsmen. Among them are: (a) Standards of selection should be maintained. (b) Adequate credit arrived at through objective measurement should be allowed for past trade experience whether obtained in civil life or in the military service. (c) The veteran apprentice should be treated as a man, not as a boy. (d) The veteran should be fully informed regarding the opportunities and limitations of the trade which he is proposing to enter.

It is our firm conviction that the ground work which has been laid will be of great significance to our military personnel as they are released from service. I hope that in some way, news can be gotten to these men, whether they are interested in apprenticeship or not, of the splendid job management and labor have been doing in their behalf.

Recent Laws Help Veterans

In considering the question of veterans in connection with apprenticeship, I want to mention briefly the two laws through which the veteran apprentice may receive aid from the Government while in training. Public 16—78th Congress provides assistance to men with service-connected disabilities. Public 346—78th Congress, better known as the "GI Bill of Rights," provides educational and training assistance to most other veterans of this war. Without attempting to dicuss any of the technical aspects of these laws I do want to say that by application to the Veterans' Administration the veteran can find out what financial assistance he is entitled to while serving his apprenticeship.

Acting upon the request of the Veterans' Administration, the Apprentice-Training Service has provided the Administrator of Veterans Affairs a complete list of all establishments whose apprenticeship programs are registered. The Apprentice-Training Service feels a heavy responsibility to these veterans and it is therefore prepared to assist establishments and labor groups in setting up apprenticeship programs, or reviewing existing ones so that these servicemen will receive the full benefits of apprenticeship.

Highlights of Discussion

Of discussions which followed presentation of the three papers, the following highlights were of interest:

1. Eligibility for apprenticeship—general practice has been to accept only high school graduates over 16 and less than 19 years old. Today of course only those not subject to draft can be considered. Older men, when not already in college or in the armed services, have usually had one or more years of work. Desire to change indicates instability.

2. Veterans' eligibility—veterans who could have qualified for apprenticeship before entering the armed services are eligible after discharge, time in service being disregarded.

3. Number of apprenticeship courses—more than 30,000 industrial establishments, in all parts of the country, now have approved apprenticeship programs in operation.

4. Vocational work as credit on apprenticeship—general practice is to give credit for previous experience on the job or for training in a vocational or technical school. Credits are not fixed or arbitrary, but are usually based upon objective tests in each case.

5. Ability to express one's self—more attention should be given, in all types of technical training, to the art of self-expression, both written and oral. Many otherwise brilliant engineers lack the ability to "put their ideas across."

6. Build prestige for engineering—the whole engineering profession, and particularly the tool engineering branch, needs to build prestige by taking pride in its accomplishments, selling itself to industry and the public, and defending itself against unwarranted attacks.

7. Old-timers help youngsters—experienced men who take the time to talk to youngsters and newcomers at Chapter meetings or other group affairs not only help the younger men and therefore the profession, but often get more than they give. Younger men with fresh viewpoints ask searching questions and thus force the old-timer to think along new lines.

8. Co-educational training—there is no reason why young women cannot be trained in tool engineering in colleges and technical schools. Many young women in war work will want to follow this profession afterwards, and daughters of engineers may want to follow in Dad's footsteps. Provision should therefore be made for them in planning training and educational courses, work in industry, and even apprenticeships.

9. Training supervisors for apprenticeship programs—many supervisors' training programs are available in night schools and within industry. Most of these programs teach supervisors to supervise, and to some extent to train or teach employees in the finer points of work with which they are already basically familiar. Supervisors of courses need more training in teaching fundamentals to beginners, as well as the more advanced teaching of the semi-skilled.

10. Building good will for the profession—trade papers generally will publicize Chapter and national activities when given the information.

A.S.T.E. NEWS

NEWS OF INTEREST AND ABOUT MEMBERS

Detroit Host to 1945 Annual Meeting

March 23 and 24 will be busy days in Detroit and at the Hotel Fort Shelby in that city when the Board of Directors of the American Society of Tool Engineers assemble for their Annual Meeting and Election of Officers. The business session will open at 9:30 A. M. on the 23rd and continue throughout the day and evening with brief intermissions for luncheon and dinner. Reconvening at 9:30 A.M. Saturday, arrangements contemplate the adjournment at noon-time. It is hoped in official circles that it will be possible to have a meeting of the new Executive Committee Saturday afternoon to organize and prepare for a year of intense activity.

The installation of the newly elected National Officers will be held at the monthly dinner meeting of the Detroit Chapter Saturday evening, March 24th. Dinner will be served in the Banquet Hall of the Engineering Society of Detroit in the Rackham Memorial. Following dinner, the group will move to the large auditorium which seats a thousand where the formal installation of National Officers will be staged and where the newly elected officers of Detroit Chapter will be inducted. Following this ceremony, Edgar Guest, famous Michiganite, will address the group using as a foil his philosophical poems.

Detroit Chapter has arranged through Past National President Walter Wagner for any members remaining over in Detroit to inspect the Ford Willow Run Bomber Plant on Sunday afternoon. Members desiring to make this trip should notify National Headquarters before the 22nd in order that arrangements may be completed.

ANNUAL MEMBERSHIP MEETING

"In accordance with the requirements of the Constitution and By-Laws, the Annual Membership Meeting of the American Society of Tool Engineers is hereby announced as being held coincidental with the Annual Meeting of the Board of Directors beginning Friday, March 23rd, 1945, at 9 A.M. in the Fort Shelby Hotel, Detroit, Michigan. The business of the membership meeting is to hear the annual report of the Board of Directors and no other activity is contemplated that cannot be deferred until travel restrictions are removed."

Extract from Minutes of Meeting of National Executive Committee American Society of Tool Engineers Held March 4, 1945.


OFFICE OF WAR MOBILIZATION AND RECONVERSION
WASHINGTON, D. C.

January 11, 1945

Mr. D. D. Burnside, President
American Society of Tool Engineers
Detroit, Michigan

Dear Mr. Burnside:

Thank you very much for your telegram stating that the Board of Directors of the American Society of Tool Engineers has postponed the Exposition scheduled for Cleveland, Ohio in March 1945 to relieve transportation facilities of this added burden.

Your cooperation in this matter is most heartening.

Sincerely yours,

James F. Byrnes
Director

Voluntary action of the Society in postponing the Exposition and National Technical sessions brought this letter of commendation from War Mobilization Director James F. Byrnes.

Annual Meeting Program

Headquarters, Hotel Fort Shelby, Detroit

Thursday March 22		Century Room
9:00 A.M.	Committee on Resolutions Irwin H. Holland, Chairman	
Friday March 23		Foyer-Sky Room
8:30 A.M.	Committee on Credentials Earl V. Johnson, Chairman	
9:00 A.M.	Board of Directors Annual Membership Meeting President D. D. Burnside, Presiding	Sky Room
	Time and Place Committee Past President Ray H. Morris, Chairman Nominating Committee L. J. Radermacher, Chairman	Place To Be Announced
Saturday March 24		
9:00 A.M.	Board of Directors Annual Membership Meeting	Reconvene
3:30 P.M.	Recess of above meetings	
6:30 P.M.	Detroit Chapter Dinner	Banquet Hall Engineering Society of Detroit
8:00 P.M.	Detroit Chapter Meeting Installation of National Officers	Auditorium Engineering Society of Detroit

A•S•T•E *NEWS*

A Publication of the American Society of Tool Engineers

1666 Penobscot Bldg. Detroit 26, Michigan

Editor, **Adrian L. Potter**
Associate Editor, **Doris B. Pratt**

The Lengthened Shadow

Seated in the office of the first school to offer a course in Tool Engineering, its founder contemplated the needs of his students and his confreres for association with other Tool Engineers.

Reaching for his telephone, he called a number of fellow engineers, ferreting out six who were imbued with enthusiasm for his idea of organizing a group of Tool Engineers to disseminate knowledge of their craft and prevent unnecessary duplication of effort.

The inspired group spent many hours spreading the gospel to others, reporting on their progress at the series of organizational meetings held in the engineering school.

They felt that success had crowned their work when they had established a society of thirty-three members eager to lend their time and talents to the cause of broadcasting the spoken and written word to Tool Engineers everywhere.

Redoubling their efforts, the thirty-three increased their numbers to the one hundred and fourteen members of the American Society of Tool Engineers who, on March 31, 1932, successfully petitioned the State of Michigan for a charter of incorporation.

It is significant of the inherent modesty of the Tool Engineer that none of the original organizers accepted an office in the new Society as reward for a task well done. They were content to let others have the limelight.

Though the young Society's courage, tenacity, and resourcefulness were tried by fire in the immediately succeeding years when the wheels of industry whirred ever more slowly, its true metal emerged bright and shining with the establishment of a second Chapter at Racine in 1935, soon to be followed by a third at Cleveland the same year.

Since then its growth has been sound, steady—and more recently phenomenal—until its 18,000 members now reach into all the leading industrial cities of the United States and Canada, as well as below the equator and beyond the seas, attesting to the fulfillment of the purposes of the Society.

As Emerson so aptly said, "An institution is the lengthened shadow of a man," so the American Society of Tool Engineers is the lengthened shadow of that small group who so tenaciously held to their objectives.

Appoints Committees to Facilitate Annual Meeting Business

Appointment of the following 1945 Annual Meeting Committees has been announced by President Burnside: Credentials—Earl V. Johnson, Chairman; H. D. Mozeen, W. A. Dawson, L. J. Radermacher; Resolutions—I. F. Holland, Chairman; W. W. Young, E. M. Seifert, A. M. Schmit, Carl A. Holmer, John Lapham, W. C. Fields, R. B. Douglas; Time and Place—Ray H. Morris, Chairman; A. J. Denis, H. R. Shearer, Hallet D. Jones, Thomas P. Orchard.

Other groups expected to convene during the Annual Meeting are the Nominating, Finance, and new Executive Committee.

Aircraft Tooling Told

York, Pa.—Technical speaker at the January 9th meeting of Central Pennsylvania Chapter, held at Pine Tree Inn, was E. A. Doogan, Chief Tool Designer, Curtiss-Wright Corporation, St. Louis.

Mr. Doogan, a Past Chairman of St. Louis Chapter and instructor in Tool Design at Western Reserve University, traced the advancement of the aircraft industry from its pre-war status, describing the various stages of production, changes of tooling and thinking made necessary by the terrifically-expanded war program.

He also showed slides illustrating many of the jigs and fixtures used in modern assembly operations, particularly those of tubular construction.

GENERAL OBJECTIVES
of
TOOL ENGINEERS' HANDBOOK

1. A REFERENCE WORK

   Not a textbook, airing hypotheses and opinions.

   Not a data-book repository for minor shop notes.

2. COMPREHENSIVE

   Covering, in some degree, every activity in which the Tool Engineer makes or influences a decision.

3. PROFESSIONALLY ARRANGED

   Data arranged according to professional outlooks—not from a single machine, product, or operational point-of-view.

4. AUTHORITATIVE

   Best contributors and checkers available.

   Data, within reason, based upon ASA and other established Standards.

5. MODERN

   Emphasizing new, vital data not yet brought into any other handbook.

6. INDEPENDENT

   Data incorporated strictly on its merits—not just because another handbook gives it.

7. EDUCATIONAL

   Needs of novices considered in selection and treatment of data.

8. SALABLE

   Data added, in excess of the Tool Engineer's strict needs, and so arranged as to appeal to general executives and others.

9. NEUTRAL

   Facilitating the use of, but not pushing the sale of, any make of equipment, materials or supplies.

Finance Committee Plans Budget

In line with recommendations of the Organization Progress Committee, President D. D. Burnside, at a meeting of the Executive Committee in Chicago, January 7-8, appointed the following to serve as a Finance Committee until the Annual Meeting:

Chairman, W. J. Frederick, Cincinnati Chapter, President, Frederick Steel Co., Cincinnati; P. W. Brown, Northern New Jersey Chapter, Director of Mfg., Wright Aeronautical Corp., Paterson, N.J.; Director A. M. Schmit, Toledo Chapter, General Mgr., A. M. Schmit Company, Toledo; and National Treasurer Floyd W. Eaton, Detroit Chapter, Works Mgr., Crawford Door Company, Detroit.

"These men were selected," hes aid, "because each of them is a successful business man with a knowledge of financial operations and possessed of sound business sense."

Chairman Frederick held a meeting of his committee in Detroit Saturday and Sunday, March 3 and 4, at the National Headquarters of the Society. The Committee studied the report of the Certified Public Accountant, who has audited the Society's books, and considered his recommendations.

"It is anticipated," said Chairman Frederick, "that we shall be able to plan a budget to cover the operations of the Society, which will be sound in all financial aspects and which will result in using the money entrusted to the Society in a way to produce greatest benefits. It is too early," he indicated, "to make too many general statements, but the Committee will have its report and recommendations to present to the Board of Directors at its Annual Meeting."

A Century of Experience at Your Service

Sometimes dry and boring, the reverse is true of ASTE Committee meetings. As testimony we offer this comment of the Sales Manager of Detroit's Hotel Fort Shelby, "Holy Mackerel, you fellows really work don't you!" This comment was made some months ago when he looked in to say "Hello" to those attending an Organization Progress Committee Meeting.

The same circumstances surrounded meetings of the OPC and the Editorial Committee February 3rd and 4th. It was a busy weekend for busy men who gave up their opportunity for respite from their busy efforts as Tool Engineers and business men to give their experience to charting the course of your Society.

The OPC spent busy hours arranging the implementation of the proposed Constitution and By-Laws. It is recognized that more information about details of Society legislation, action and plans must be given to all members. To accomplish this end, Chapter organization and operation must be put on a standard basis in order to permit proper integration of effort and effective operation with the business set-up at the National office.

Members of OPC in attendance at the deliberations included C. V. Briner, A. M. Sargent, W. B. Peirce, W. J. Frederick, Ray H. Morris and G. J. Hawkey. I. F. Holland was obliged to cancel his reservation at the last minute because the war interfered.

Well qualified for their important assignment, this group has had a total combined experience of 19 years as Chapter Officers . . . 14 years as National Officers . . . 21 years as National and Regional Directors . . . 17 years

(Continued on Page 50, Col. 1)

Constitutional Revisions Proposed

Hartford, Conn. — Majority approval of the assiduous work of the Organization Progress Committee, chairmanned by Vice President Briner, was voted by the National Constitution and By-Laws Committee in favoring the adoption of the proposed revised Constitution.

Voting among the Chapter representatives of the latter committee closed February 20th, an extension of the time stipulated in the ballot accompanying the suggested, amended legislation and comparative index.

In his introductory letter, National Constitution and By-Laws Chairman I. F. Holland explained:

Herewith is a copy of the proposed revised Constitution and By-Laws which has been presented to the National Constitution and By-Laws Committee.

The foregoing was supported by a petition in proper form in accordance with Article C 14 of the Constitution and had more than the required number of signatures of Senior Members in good standing.

It therefore now becomes necessary to submit the matter to the Constitution and By-Laws Committee of each Chapter "for approval or disapproval of the Constitutional revisions as submitted." If approved by a majority of the Chapters, it will, in accordance with the procedures established by our Constitution (C 14–1), be submitted to the membership for their ballot.

This matter is of considerable importance, and we recommend that it be discussed with each Chapter Executive Committee, or with the Chapter Officers if you have no Executive Committee, before you send in your vote on this matter.

I think the best explanation that can be made is covered by report of the

(Continued on Page 50, Col. 2)

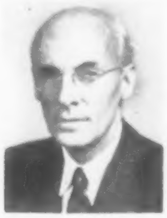
PROJECT PLANNERS

R. H. Morris
Editorial
OPC

A. M. Schmit
Editorial
Finance

C. V. Briner
Chairman
OPC
Editorial

W. J. Frederick
Chairman
Finance
OPC



G. J. Hawkey
Editorial
OPC

A. L. Potter
Editorial
OPC

I. F. Holland
OPC

F. W. Eaton
Finance

W. B. Peirce
OPC

P. W. Brown
Finance

A. M. Sargent
OPC

CENTURY OF EXPERIENCE

(*Continued from Page 49, Col. 2*)

as National Committee Chairmen . . . 21 years as National Committee Members—aggregating 92 years of voluntary, uncompensated service to ASTE.

These men are planning for complete operation schedules for all committees, Chapters and officers. In order to secure best information on the fundamentals determined in the early days of the Society, they are turning for assistance to members who have rendered outstanding service on standing committees. They are seeking their co-operation in preparing complete guidance bulletins for the following committees: Constitution and By-Laws, Standards, Membership, Public Relations, Education, Editorial, and Program.

Prior to the meeting Chairman Briner had received more than a hundred letters from Chapter Officers and Committee Chairmen in reply to his request for information based on the experience of each.

The Editorial Committee, appointed by President D. D. Burnside December 7, 1944, and comprising C. V. Briner, Chairman; R. H. Morris, A. M. Schmit, G. J. Hawkey, and A. L. Potter, held sessions coincident with the OPC. The Fort Shelby was a busy place with conferences in several roms at once. Long sessions with Executive Editor Robert B. Powers, Technical Editor Andrew E. Rylander and Executive Secretary Potter indicated the progress being made with the Society's publication.

The problems proved to be many. Policies of magazine content, departments, subjects to be presented as timely and of real educational value were discussed. The necessity for having a *Tool Engineer* of prime educational value was emphasized. It was impressed upon those present that although the Society is not in the publishing business of its own choice, now that we are, we must do the kind of a job for our members which has been long hoped for.

The Tool Engineer must become a quality publication, in editorial content and style. Reports indicated splendid co-operation from those who have subjects of value to present to the membership.

It was brought out that sixteen pages are allocated for news of the Chapters and our members, a great increase in the volume of space formerly used. Editor Powers outlined many of the mechanical problems faced by publishers, and Andy Rylander prophesied an outstanding series of technical articles.

The Editorial Committee plans to meet at least once each month to consider material submitted for publication and to review operating policies as new problems may develop, all to the end that *The Tool Engineer* shall meet with ready acceptance and hearty approval of as many as possible of our nearly 18,000 members.

Tooling-Up for the Handbook

New York—The Handbook Committee held its first planning session with Frank W. Wilson, new editor of the projected "Tool Engineers' Handbook," at the Commodore Hotel, February 16th and 17th.

E. W. Ernst, R. B. Douglas, and Frank W. Curtis discussed with Mr. Wilson the general objectives of the book, its overall structure and contents, as well as data contributors and checkers.

Editor Wilson tabulated the following nine points as objectives to strive for:

1. "A Reference Work: Not a textbook, airing hypotheses and opinions. Not a data-book repository for minor shop notes.

2. "Comprehensive: Covering, in some degree, every activity in which the Tool Engineer makes or influences a decision.

3. "Professionally Arranged: "Data arranged according to professional outlooks—not from a single machine, product, or operational-point-of-view.

4. "Authoritative: Best contributors and checkers available. Data, within reason, based upon ASA and other established Standards.

5. "Modern: Emphasizing new, vital data not yet brought into any other handbook.

6. "Independent: Data incorporated strictly on its merits—not merely because another handbook gives it.

7. "Educational: Needs of novices considered in selection and treatment of data.

8. "Salable: Data added, in excess of the Tool Engineers' strict needs, and so arranged as to appeal to general executives and others.

9. "Neutral: Facilitating the use of, but not pushing the sale of, any make of equipment, materials or supplies."

The Committee agreed that the Handbook should not contain a collection of shop short-cuts, such as, for example, a simpler way to remove chips from taps, but should be of a high calibre, covering the entire field of tool engineering. From a breakdown of Society membership, it is evident that Tool Engineers are making or influencing decisions in every industrial plant activity.

They felt that, if the book were to be a comprehensive reference work, it must include such phases as production planning and control, tool engineering economics and product design. "Whole classes of data," observed the Editor, "which are not visibly evident in either of the two existing handbooks which might be considered as most nearly related to ours."

The physical order in which various classifications of material should be arranged was discussed at length, the committee concurring that a logical structure and sequence should be determined and maintained; that the completed book should not only cover the needs of the practising Tool Engineer, but should also be a working tool for the student engineer and the industrial plant executive who wishes to acquaint himself with the many operations that can affect his profits.

Mr. Wilson submitted an extensive list of potential contributors and possible contributions of material they might make.

He commented that manufacturers were co-operating "almost to the point of embarrassment." Catalogs and data sheets are pouring in by the hundred, almost invariably with offers of further assistance.

Subsequent conferences will be held with the Editor to study the detailed contents of the Handbook which the Committee feels will be a big achievement in ASTE history.

CONSTITUTIONAL REVISIONS

(*Continued from Page 49, Col. 3*)

Organization Progress Committee which was submitted to the Board of Directors in October, and which reads as follows:

"This committee was appointed with definite instructions 'to study the corporate structure of our Society with the thought in mind of broadening ASTE objectives in line with the present trend, and along lines somewhat similar to those pursued by our contemporary engineering societies in Great Britain and Germany, prior to the War.' This activity will also naturally involve a simplification and modification of our Constitution and By-Laws.

"In accordance with these instructions, your committee have attempted a complete survey of the activities, as well as the corporate structure of the Society and have completed what we feel to be the necessary first step in our work. We are proposing certain revisions in our Constitution and By-Laws.

"This document, as we present it, has been formulated after considering all proposals and suggestions made to us as a group or secured by individual members of the committee thru contacts with members of the Society, thru a study of the structures of other organizations and on the advice of legal counsel present during our deliberations.

"We have endeavored to build a Constitution which would be reasonably stable over a period of years; which would, so far as possible, eliminate the necessity for the constant proposals of constitutional changes which have been unreasonably expensive and which have made somewhat of a hodgepodge of our present law.

"In this endeavor we have not permitted tradition to bind our thinking, and yet we have tried to gather everything of value from our past history and experiences. In this proposed Constitution we have striven for brevity and clarity and have thought more of permissions than of prohibitions. We believe these new laws will permit the Society to do these things neces-

ry to insure its growth, and that they ill not hamper future endeavors by necessary restrictions.

"Perhaps most important of all, we lieve these proposed changes will ermit a closer control of Society af- irs thru the Chapter and the House Delegates than is possible at pres- nt; will keep the control in the hands the individual member, where it ightfully belongs, and will at the ame time give us a more truly na- ional representation with a corre- pondingly broader national view.

"Your committee's work has only egun. Studies so far have brought o light certain structural weaknesses which cannot be corrected by law. The most glaring of these is perhaps the woeful lack of contact between our various branches, between the national body and the local Chapter, between the National Committee Chairmen and the local Chapter Chairmen, and the lack of definite instructions to the various workers, both national and local.

Work with this group [Organization Progress Committee] *has demonstrated that there are members of our Society willing to make great personal sacrifices and to devote a great amount of their energies to the work of our organization. We believe that we have available numberless other members with the same ideas, ideals, and spirit who have been anxious to work, but who have lacked instructions and direction.*

"If these proposals are adopted, it is our hope to implement this Constitution and By-Laws with a complete set of procedures, an organization chart with detailed instructions for each working member of the Society. In short, we believe that no plan will work of itself, and we suggest that this Organization Progress Committee be continued and instructed to prepare such documents as will make this plan work."

The Organization Progress Committee was made up of men who have had many years of experience in Society affairs, and the proposed revised Constitution and By-Laws represents the combined judgment of this group after spending over 800 man hours on this document in meetings, plus many days of individual work, and represents the thinking of this group for the best interest of the Society as they see it.

The fact that a petition has been received to process these changes, makes it necessary to either accept or reject the work in its entirety. No changes may be made inasmuch as the petition was attached to a copy of the revised Constitution and By-Laws.

It is not necessary to submit the By-Laws to the membership for a vote, inasmuch as the membership vote on the Constitution only, but as long as we had a complete layout, it was thought best to submit the By-Laws with the Constitution so that the Chapter Constitution and By-Laws Comittees would be fully informed when asked to act on this question.

The Directors have been fully informed and each Director has been asked to contact each of his Chapters and explain the purpose of the proposed changes in detail. In the opinion of the writer, these changes represent one of the greatest advances in organization progress since the ASTE was formed.

If it is decided to submit the proposed changes to the Membership for their ballot, it will be necessary at that time to include a resolution covering interim operation of the Society during the period after the operation of the old Constitution and the time when the new Constitution can become fully operative.

This will be necessary because of the time lapse provided in the new Constitution for the appointment of Nominating Committees, election of Chapter delegates, and so forth, for the functioning of the Society under the revised Constitution and By-Laws, if and when the proposed revisions are accepted. It is not necessary to introduce the resolution at this point, and if and when it becomes necessary, it will be submitted to the Membership for vote along with the proposed revisions.

The re-written Constitution, which will be submitted to the membership for ratification, follows the existing one substantially, with new provisions, clarifications, and the assembling of related data. Physically, it has been simplified, line references replacing Article and Section numbers, with a comprehensive cross-index in preparation.

Briefly, the changes and additions include:

Broadened membership qualifications and the establishment of two new grades.

Liberalization of the candidacy of Honorary and Life Members.

Privilege of securing Certificate of Membership.

Shortened grace period before removal for non-payment of dues.

Added conditions for dismissal from the Society: falsifying membership qualifications; failure or impropriety in executing duties of office.

Provision for "House of Delegates," a body of elected Chapter representatives giving the membership new powers, particularly in controlling the election of National Officers.

Reduction of Board of Directors to 11 members, 10 of whom shall be elected by the House of Delegates. (The retiring President automatically becomes the eleventh Dirctor.)

Nominees for Directors must include Vice-Presidents, National Secretary and National Treasurer, while presidential candidates must be Directors.

Any vacancy in the Board of Directors is to be filled by the losing candidate receiving the highest number of votes in the previous election.

Creation of a Finance Committee, appointed by the President and consisting of the National Treasurer and not less than four other members who are not Directors nor National Officers.

Number of signatures required for petition to amend Constitution increased from 20 to 75.

Annual Nominating Committee to consist of at least five members nominated by the President and elected by the Board of Directors at their Semi-Annual Meeting.

Writes New Induction Heating Study

Springfield, Mass.—Frank W. Curtis, Consulting Engineer for Induction Heating Corporation, New York, is the author of a new book entitled "High-Frequency Induction Heating."

Frank W. Curtis

Mr. Curtis, an authority on this type of heat treating and a distinguished member of the Society, has written many induction heating articles for *The Tool Engineer* and other technical journals and trade papers. "Tooling For Induction Heating" appearing in the February, 1945, *Tool Engineer* is one of his most recent writings. His books, "Tool Engineering of Jigs and Fixtures," and "Tool Engineering of Punches, Dies and Gages," preceded the current volume.

In addition to serving as Director of Region 2, Mr. Curtis is Recorder of the Nominating Committee and a member of the Handbook Committee. He is a Past President of ASTE, former National Program Chairman and Area Vice-Chairman of the National Membership Committee, as well as a Past Chairman of Springfield (Mass.) Chapter.

Nominations for Directors to be submitted by Annual Nominating Committee at January Chapter meetings.

One Delegate and an Alternate to be elected by each Chapter for representation in the House of Delegates.

Provision for election of a Delegate-at-Large to represent members who have no Chapter affiliation.

The qualifying By-Laws, to be voted upon by the Board of Directors, cover:

Establishment of October 1st as beginning of fiscal year.

Revised and supplementary scale of initiation fees and dues, to include new grades of membership.

Financial aid for new or small Chapters.

Establishment of four months from date of invoice as time limit for dues payment.

Election of Directors by House of Delegates rather than by membership.

Authorization of Executive Secretary as Budget Director and Society Manager.

Preparation of budget by Finance Committee.

Presidential approval of proposed Chapter fund-raising activities.

Nomination of Delegates and Alternates by Chapter Nominating Committee.

Authorization of a Delegate to represent more than one Chapter and to cast one vote in the election of each Director, Life or Honorary Member for each Chapter so represented.

Election by the House of Delegates of a Credentials Committee to register nominations for Directors.

Privilege of Delegates to present matters for future consideration by the Board.

Engineered Photography Wins Acclaim

Fort Wayne, Ind. — Engineering principles applied to an avocation have served Louis A. Puggard well in his hobby of flashlight photography.

Louis A. Puggard

The ASTE'er, Chief Engineer, OK Machine Company, says of his prize-winning shots, "The pictures I take have been taken by others, a million times before, but mine are different. It is just like solving an engineering problem —all of my pictures are conceived in advance, like the designing of a tool or die."

another prize camera study has been exposed.

During the four years that he has pursued his artistic hobby, over 100 awards for outstanding amateur photography have come to the local engineer. He captured top honors in the 1943 contests conducted by *Good Photography* and the Dog Writers Association. Many well-known publications, including *Newsweek* and the *Chicago Sunday Tribune,* have reproduced his pictures. The Detroit Institute of Arts considered his entry in the Detroit 12th International Salon "one of the most outstanding salon contributions of the year."

He is affiliated with several camera clubs in Detroit, his former home, and in Fort Wayne. Inspiration for his exceptional photography apparent-

Ha!

This stray animal provided the unusual "laughing cat" portrait that has already won seven prizes and is still being exhibited by Louis A. Puggard.

Peace Feelers

Four times prize winner, this appealing study of feline and canine expressions depicts Louis A. Puggard's pet cocker and a strange cat.

His favorite models are his children and his pets—particularly, his photogenic cocker spaniel who has become so camera-conscious that she tries to "steal the scene" even when other subjects are being photographed.

Photographer Puggard draws sketches of his proposed compositions, places his subjects, adjusts his camera —and waits until, as he says, "things begin to happen." At the psychological moment, he clicks the shutter, and

ly comes from his vocation, as he believes in doing old things a new way, and enjoys tackling tasks that can't be done.

His company, designers and builders of precision tools and dies, "does things that others consider impossible."

Before making his present connection, he supervised die-designing for a number of years at General Motors and Chrysler.

Tells How To Preserve Perishable Tools

Racine, Wis.—"Perishable Tools on the Firing Line" was presented by W. A. Johnson, Special Engineer for the International Harvester Company, before the approximately 100 members and guests of Chapter 2 when they met at the Manufacturers Association Febuary 5th.

Highlighting his speech was a discussion of the five following ways of prolonging the life of cutting tools: (1) the right tool on the right job; (2) proper feeds and speeds; (3) proper grinds, clearances, and so forth; (4) proper coolant and lubricant; (5) fine finish grinds.

Four additional means of providing protection and longer tool life, pointed out by the speaker as still being in the experimental stage are: (1) nitriding, (2) sub-zero freezing, (3) microblast, and (4) flush chrome plating.

Mr. Johnson also mentioned the three conventional means of reclaiming tools—(1) regrinding in the hand, (2) build-up welding, and (3) low-temperature brazing.

Following the technical session, election of officers was conducted with the following chosen to head the Chapter for 1945-46: Chairman, R. M. Goodsell, President, Racine Plating Co.; First Vice-Chairman, Alfred P. Nelson, Time Study Eng.; Second Vice-Chairman, F. R. Fisher, Tool Engineer, J. I. Case Co.; Secretary, George Klimt, Treasurer, Joseph H. Holzmann, Tool Engineers, Young Radiator Co.

Powder Metallurgy Technical Topic

Philadelphia, Pa.—George E. Platzer, Chief Engineer, Amplex Div. Chrysler Corp., Detroit, was the technical speaker at the February 15th meeting held by Chapter 15 at the Engineers Club. Mr. Platzer presented the popular subject, "Powder Metallurgy," using slides to illustrate equipment and parts used in this process.

"Tool Steels of Today," the coffee talk, was given by N. W. Dalrymple, Asst. Eng. of Tests, Bethlehem Steel Co., Bethlehem. The speaker made a brief survey of the elementary phases of tool steel and its uses on odd applications. Slides augmented his talk.

The dinner preceding the meeting attracted 155, with attendance increased to 266 for the technical session and business meeting which was featured by the annual election of officers. Chapter leaders selected for the 1945-46 season are: Chairman, John Noble, Tool Engineer, William Sellers & Co., Inc.; First Vice-Chairman, Howard W. Gross, Dean, Spring Garden Institute; Second Vice-Chairman, Joseph H. Walter, Mech. Engineer, Jackson Associates; Secretary, W. W. Cady, Abrasive Eng., Robertson Mfg. Co., Trenton, N.J.; Treasurer, James C. Sorensen, Supervisor of Tool Design, Westinghouse Elec. & Mfg. Co., Lester, Pa.

At the January 18th meeting, the film, "Die Casting,"' produced by the New Jersey Zinc Co., New York City, was shown by C. R. Maxon of the company's Market Development Division. Mr. Maxon was kept busy answering questions for some time after the screening of his excellent film.

A splendid talk on an unusual subject, " Pigeons in War and Peace," was given by Charles J. Love of the *Philadelphia Evening Bulletin* and a Past President of the American Homing Pigeon Fanciers.

Plant Extends "Open House"

Cleveland, Ohio — Another educational trip through an outstanding local plant, successfully engineered by Program Chairman J. I. Karash, resulted from the expressed desire of Chapter 3's membership for more plant tours, when the Tapco Plant of Thompson Products, Inc., was host to the group February 9th.

An extraordinary dinner at the plant, music and radio entertainers regaled the engineers before settling down to the serious business of electing the following officers for 1945-46: Chairman, Joseph I. Karash, Plant Engineer, Reliance Electric and Engineering Co.; First Vice-Chairman, Rudolph E. Harrold, Process Engineer, Ohio Crankshaft Co.; Second Vice-Chairman, Edgar W. Baumgardner, Machine and Tool Designer, National Carbon Co.; Secretary, Warren H. Fitzsimmons, Partner, Die Supply Co.; Treasurer, Harold E. Peiffer, Chief Methods Eng., Barth Stamping & Machine Works.

Emil Girian, Chief Engineer, Thompson Aircraft Products Co., welcomed the guests, reviewed the history of the plant and escorted the visitors on a tour of inspection. This opportunity to see an ultra-modern plant in operation was one of the red-letter events of the season's program.

Explains "Rotofinish"

Milwaukee, Wis.—The method of ...rring parts, known as "Rotofinish," is explained by Forest L. Grim, Development Engineer for Sturgis Products Co., Sturgis, Mich, when Chapter met February 8 at the Astor Hotel. Numerous samples, before and after processing, were passed among the audience, and questions from the floor were answered by the speaker.

Voting for new officers followed the technical talk, resulting in the election of: Chairman, A. R. Gieringer, Pres., A. R. Gieringer Tool & Mfg. Co.; First Vice-Chairman, Roland Nauertz, Tool Eng., Cutler-Hammer, Inc.; Second Vice-Chairman, Joseph B. Jilbert, Jr., Dept. Eng., Ampco Metal, Inc.; Secretary, Richard H. Ford, Production Service Eng., Kearney & Trecker Corp., West Allis; Treasurer, Joseph Ebner, Shop Supt., Outboard, Marine & Mfg. Co., Evinrude Div.

* * *

The winter dinner dance, held January 20th at the Hotel Pfister, was a huge success, the committee having done a "bang-up" job of handling physical arrangements. Dancing to the old and modern music of Frank Rausch and his orchestra was enjoyed by everyone present, including many guests from Racine and Fond du Lac.

Convention Topic Repeated

Rochester, N. Y.—"Tooling Instrument Work For Factory Production," the story of the manufacture of the panoramic gunsight which was presented at the Syracuse Semi-Annual Meeting and published in the February issue of *The Tool Engineer,* featured the technical session at the February 15th meeting held by Chapter 16 at the Rochester Institute of Technology.

F. W. Darling, Supt. of Process, Camera Works Div., Eastman Kodak Co., introduced the subject and the speakers, all of whom are from his plant.

Phases described were: "Construction and Use in the Field," Francis M. Shull, Optical Engineer; "Machining, Assembly and Testing Methods," Paul G. Yingling, Process Engineer; "Interesting and Unusual Tooling Devices," William R. Gordon, Chief Tool Engineer; "Training of Workers," Howard C. Wellman, Training Supervisor. Messrs. Gordon and Yingling are members of Rochester Chapter.

Problems concerning the disposal of the enormous amount of surplus war material on hand were depicted in the sound film, "Aftermath of War Production."

The annual election of officers, participated in by the voting members among the approximately 125 present, gave the direction of Chapter affairs for 1945-46 to: Chairman, Earle De Bisschop, Methods Engineer, Folmer-Graflex Corp.; First Vice-Chairman, Charles E. Seely, Plant Engineer, International Business Machines; Second Vice-Chairman, Milton Roessel, Tool Engineer; Third Vice Chairman, Herbert O. Simon, Supervisor, Rochester Products Div., G.M.C.; Secretary, Donald Kohler, Secretary, Genesee Mfg. Co.; Treasurer, Fred E. Bittner, Process Engineer, Ritter Co., Inc.

Fortune Spreads Fame

Waltham, Mass.—Public recognition of his half-century of building precision tools and machinery came to W. H. Nichols, founder and Manager of W. H. Nichols & Sons, when *Fortune* magazine reported his company's achievement in machining Nylon pump gears to a "quarter-tenth" tolerance.

Published under the caption, "Anything Almost Right Is Wrong," in the "Business At War" section, the business magazine's story reads: "W. H. Nichols, of Waltham, Massachusetts, is a survival of the old breed of machinists who worked their lathes by foot power and relied on cut-and-try instead of theory to cut hard metal to accurate dimensions.

W. H. Nichols

A. A. Nichols

W. Hart Nichols

"In the utterly precise machine trade, 'W.H.' has won the reputation for a precision that is truly hairsplitting. For fifty years he has been known as 'Accurate Nichols' because, in the nineties, he was able to devise a method for cutting accurately spaced slots in an early tabulator for International Business Machines that had stumped everyone else.

"Although he is now the master of a \$5-million-a-year business, and counts General Electric, Westinghouse, Pratt & Whitney Aircraft, and Ford among his customers, he still has no office: he prefers to open his mail with a pocketknife at the corner of the receptionist's desk. He shuns chairs, preferring to perch on wastebaskets, the edges of which he has worn paintless.

"Making money, except to expand his plant and buy more costly and delicate machinery, doesn't interest him—it is doubtful if he has ever taken more than \$6,000 a year out of his plant. He still lives in the modest white clapboard house adjoining the shop, on land along the Charles River that was once the city dump.

"Because of his reputation for being able to build things that no one else could build, W. H. has enjoyed good years in wartime. Up to 1941 he never grossed more than \$1 million a year; that year he did \$2 million worth of business and the next year he doubled it, making a profit of about \$250,000 each year. Last year, although his gross topped \$5 million for the first time, renegotiation and sales-price adjustments (\$2,100,000) and taxes (\$1,250,000) cost him his profits. He actually had to go to the banks to balance his books.

"The loss did not annoy him so much as the government's refusal to let him write off the \$546,000 he spent for wartime plant expansion. 'You can't apply common sense to such bureaucratic orders,' he says. 'We used to be able to take care of the help in a depression. Now, with no money in the bank, what can we do?'

"Twenty years ago Nichols was visited by a man named Frederic McIntyre, who had an idea for a new kind of pump to make rayon fibre of uniform thickness, a goal long sought by the rayon industry. The difficulty was that no one had been able to make it to the extremely close tolerances required. Browne & Sharpe, the famous New England machine-tool makers, had sent McIntyre to see Nichols. 'If anyone can build that thing of yours,' he was told, 'Nichols can.'

"W. H., it turned out, could and did. The pump he made, which consists of two accurate gears enclosed in a close-fitting housing, is guaranteed to hold the flow of solution from which rayon filament is made within 1 per cent of normal. Normal is .587 cubic centimeters per revolution of the gears, or $^{5}/_{100}$ of a cubic inch, during an eight-minute run.

"The problem in making the pump was to get the gears to mesh to unheard-of-closeness, and still clear the walls of the housing. They had to be built to what machinists call 'quarter-tenth' tolerance—.000025, or a quarter of a ten-thousandth of an inch. Such a tolerance is so small that it cannot be measured with ordinary gauges, but only by special Zeiss optical testers.

"Since 1928 Nichols has built about 400,000 rayon pumps of gleaming stainless steel, small enough to fit in your hand. They are sold by McIntyre through Zenith Products under an oral agreement between the two men. 'I'm not a damned bit salesman-minded,' W. H. says. Ninety-five percent of U.S. and South American rayon producers use them, and current production is 2,000 to 3,000 per month. But the rayon pump, in wartime, is merely an example of the kind of work that Nichols likes to do —'precise handwork on a quantity basis.'

"The rayon pump, modified to save weight, supplies fluid to prevent ice from forming on airplane propellers. Monthly production is now around 6,000. A similar pump, developed for the du Ponts to make nylon filaments, has a wide wartime use. Another pump, called the 'Gerotor' and originally developed for the May Oil Burner Corp., lubricates airplane turbosuperchargers and the gas-turbine engine in the Army's new jet-propelled fighter plane (*Fortune*, June, 1944): The Gerotor also operates am-

(*Cont. on Page 54, Col. 1*)

Officers Endorsed for Second Term

Elmira, N.Y.—Despite an enforced business holiday, caused by the fuel and power shortage, a tasty dinner of spare ribs and sauerkraut was served by Mark Twain Hotel to about 100 members and guests of Chapter 24, as scheduled, February 5th. Those with more delicate digestions enjoyed roast chicken.

George N. Morceau

The annual election, the principal business of the meeting, resulted in most of those now holding office being returned to serve another term. Voted in again are: Chairman George N. Morceau, Mgr., Tool & Eng. Div., LeValley-McLeod-Kincaid Co., Inc.; First Vice-Chairman Burr W. Jones, Patent and Development Eng.; Secretary Floyd B. Allen, and Treasurer Lester F. Trew, Methods Engineers, Eclipse Mach. Div., Bendix Aviation Corp. Edward Stachel, Supt., Swift Lubricator Co., was chosen for Second Vice-Chairman.

Special tribute was paid to two recently-deceased members, Gustave A. Lundgren and Howard S. Stratton.

Program Chairman Burr W. Jones introduced the technical speaker Fred W. Whitcomb, Development Engineer, Motor Products Corp., North Chicago, who presented a brilliant and witty discussion of "The Effect of Sub-Zero Temperatures on Metals and Materials."

He analyzed the cold treatment of several steels and other materials, especially as affecting hardening, stabilization, cycling and critical range, thus stimulating a productive discussion period.

Two sound films, "Sand and Flame," unveiling many of the secrets of glass making, and "How Not To Conduct a Meeting," featuring Lemuel Q. Stoopnagle, concluded the program.

Visitors from Worcester and Syracuse Chapters were present, with a special group of students from the Elmira Free Academy attending the technical session.

"Fortune Spreads Fame"

(Cont. from Page 53)

munition hoists in ships and controls turrets on tanks.

"Nichols is working on other pumps that as yet are military secrets. Besides, the plant makes about thirty Nichols hand millers a month, a precision production machine for many industrial operations. And a new division in Lexington, Massachusetts, is devoted entirely to production of intricate devices used in radar work.

"The most prominent slogan in the Nichols shop is 'Anything almost right is wrong.' Even when Nichols was a schoolboy in Hamilton, Ontario, he applied painstaking machine-shop principles to his tinkering, and once built a bicycle on which he says he set a new world's record for a quarter mile.

"Leaving home when his father ordered him to quit fooling with machines and prepare to enter the ministry, he migrated to Hartford, home of great machine shops, to work at Pratt & Whitney. In 1902 he went to Waltham to start out as his own boss, building delicate watchmaking machinery and subcontracting for I.B.M.

"The panic of 1907 almost broke him—that winter he subsisted on potatoes and codfish trimmings. But he pulled through, and by 1912 built the first shop on the present site. Slowly he expanded his business sent his sons Arthur and Hart to M.I.T., and began to indulge his hobbies of watch collecting and aeronautical research.

"In 1939 his sons went into partnership with him, Arthur in engineering and Hart in administration, but the sign over the main entrance still does not mention them. 'Any damned fool,' says W. H., 'knows it's W. H. Nichols & Sons.'

"Nichols relies on an almost intuitive sense of machinery and the way it works to solve his problems. When he began to think about the Gerotor, he operated in the face of a solemn warning by M.I.T. authorities that the machine could not be built in mass production.

"Because the internal gear of this pump came into contact with its mating gear at several places at the same time, machine men believed both parts had to be made together. Nichols refuted all these critics by building 13,000 to 16,000 Gerotors a month for military purposes, and by making the components in separate departments.

"The Nichols shop is still largely a one-man show. After a cursory glance at the mail, which bores him, W. H. likes to prowl around the plant. If he finds a worker making a mistake, he backs up a few paces and in the explicit, fiery language of the old-time machinist roars out a lecture that everyone within fifty feet can hear.

"When he isn't in the plant, he can usually be found in the cellar workshop of his house, building a precision instrument to outdo Zeiss, trying out a new method of making a flat sur--face or tinkering with 'Ella Cinders,' a seven-and-a-quarter-inch-gauge locomotive that draws a train holding twelve people around his property. 'It's a good engine,' W. H. says, 'runs all over the lot on a couple hatfuls of coal.'

"Even if Nichols had only the rayon pump to make in the postwar he would be satisfied. He also has Gerotors and the hand millers. He hopes to retain 500 of his 750 employees in the years immediately following the peace, just to keep up with demand for the high-precision pumps.

"Beyond that, he has full confidence that when manufacturers want a tricky, special machine, they will come to him. He is thinking all the time about the future—'take it from an old bicycle racer,' he says, 'this is no time for coasting.' "—*Fortune*, July, 1944. Copyright *Time, Inc.*

Mr. Nichols and his two partner-sons, W. Hart and Arthur A., are all affiliated with Boston Chapter. The latter, a charter member, has served as Editorial, Constitution and By-Laws, Membership, and Program Chairman, as well as Chapter Secretary, and is now **Chairman-Elect.**

Chapter Visits Arsenal

Schenectady, N. Y.—General Gillespie, Commanding Officer, welcomed the approximately 100 members and guests of Chapter 20 to Watervliet Arsenal for their February 8th meeting. Major King also spoke briefly commending the group on the fine arrangements made for the meeting and commenting on his recent retirement.

Following an appetizing baked ham dinner, the annual election of officers was conducted with all Nominating Committee candidates voted approval. Those elected are: Chairman, E. H. Girardot, Foreman, Tool Design; First Vice-Chairman, D. M. Schiele, Planner and Ratesetter, General Electric Co.; Second Vice-Chairman, B. L. Hayner, Tool Designer, Watervliet Arsenal, Watervliet; Third Vice-Chairman, W. H. Powell, General Foreman; Secretary, N. Y. Coxe, Works Manager; Treasurer, R. H. Wilke, General Foreman, General Electric Co.

Speaker of the evening Howard J. Stagg, Tool Steel Div., Crucible Steel Co. of America gave a very well presented talk on "Proper and Improper Design of Tools and Dies." He stressed the fundamentals of good design, the elimination of points of stress concentration, and modern heat treatment of tool steels. Slides were used for further illustration.

After adjournment of the meeting, Chapter members, employed at the Arsenal, conducted the group on a tour of inspection of several buildings.

Service Emblems for Five ASTE'ers

Detroit—Diamond-set, gold lapel service buttons were presented to five Society members associated with Snyder Tool & Engineering Company, when that organization celebrated the 20th anniversary of its founding with a dinner for the entire personnel January 20th.

G. H. Whitehouse Clarence Snyder

ASTE'er Clarence Snyder, founder and President, sketching the company's history and growth in the field of special purpose machinery, paid tribute to the part played by each individual, pointing out that 30% of the staff had five or more years of service.

Besides Mr. Snyder, the following members of Detroit Chapter are affiliated with his company and were among those receiving buttons in recognition of their respective periods of service: Larry S. Andrich, Vice President, 15 years; George H. Whitehouse, Sales Manager, 13 years; William C. Oberem, Chief Engineer, and George D. Melling, Sales Engineer, 7 years each.

Sales Manager Whitehouse is a Past Chairman of Detroit Chapter.

Air Force and Gaging Speakers Highlight Election Meeting

Dayton, Ohio—The annual election of officers was the principal item of business on the agenda of Chapter 18's February 12th meeting at Van Cleve Hotel.

Chosen to lead the Chapter for the coming year are: Chairman, George Tillotson, Production Engineer, Aeroproducts, Inc.; First Vice Chairman, Adam Lensch, Supt. of Maintenance and Production, Kuhns Bros. Co.; Second Vice Chairman, Ralph E. Lilleberg, Sales Engineer, Gage Div., The Sheffield Corp.; Secretary, J. Robert Kuntz, Foreman, Tool Room, Inland Div., General Motors Corp.; and Treasurer, Chester List, Salesman, Seifreat-Elsted Mach. Co.

After the business meeting, Major Raymond Fanning, Wright Field, enlightened the group with an up-to-date analysis of the war, from an Air Force viewpoint.

George Webber, President, Webber Gage Co., Cleveland, detailed very interestingly, the development of gage blocks, demonstrating the latest theories in working blocks and angle blocks.

Lt. Kined, Naval Ordnance Inspector for the Dayton Area, was a guest at the meeting.

Tool Engineers Sponsor Classes

Springfield, Ill. — The opening of the second semester of a class in Tool Engineers' methematics was recently announced by Chapter 64.

The class, with C. P. Hafel as instructor, meets twice weekly from 7:30 to 9:30 P.M., Mondays and Thursdays at Springfield Junior College, in cooperation with the University of Illinois.

Measures With Light Waves

Decatur, Ill. — Chapter 58's first meeting of the year was held January 3rd at Masonic Temple with Adam Gabriel, Vice President, Acme Industrial Company, Chicago, as principal speaker.

His subject, "Light Waves and Their Use in Shop Measurement," was received with enthusiasm because of its clear illustrations of how light waves are actually used in everyday shop practice to an extremely successful degree. Mr. Gabriel's practical experience and unusual ability to simplify very technical points made the discussion very understandable.

* * *

Officers elected at the February 7th meeting are: Chairman, Harry J. Moffat, Supt., Tool and Supply Stores; Secretary, Victor R. Farlow, General Foreman, Metallurgical Dept., both of Caterpillar Military Engine Co. Harry B. Williams, Plant Supt., Decatur Pump Co., is First Vice Chairman, with Eugene A. Carlier, General Supt., U. S. Mfg. Corp., Second Vice Chairman, and Harold H. Behnke, Asst. Chief Tool Designer, A. E. Stanley Mfg. Co., Chapter Treasurer.

Quality Control Valuable Tool

Boston, Mass.—Emphasizing that management must be sold on Quality Control as a valuable tool, Charles R. Scott, Jr., General Manager of Quality Control at the S.K.F. Philadelphia Plant, outlined some phases of this broad subject at the February 8th meeting of Chapter 33. As proof that properly-tabulated information will improve manufacturing operations and techniques, he cited an example in one of his company's plants where employees had increased from 1500 to 7000, but the ratio of inspectors to production had not increased, despite new and inexperienced help.

A definite inspection procedure to prevent rather than to correct defects is necessary, the speaker asserted. This also involves establishing tolerances with due consideration for the engineering request for perfection, the shop's version of possible machine tolerance and the economic tolerance. The process must then be controlled with the variable characteristics determined and eliminated. Standards for accurate data reports are set up in order that the information may be tabulated and interpreted.

The use of inspection by sampling was explained, along with importance of the size (evolved through mathematical analysis) of the sample necessary to insure a reasonable probability of its being representative of the lot. If such a sample reveals no defective parts, re-inspection is unnecessary. When the reports to departments, foremen, and management are examined, causes of defects are reduced to a minimum.

If a department has a high percentage of rejects, roving quality control inspectors work with the foreman to bring it back under control.

Accuracy of inspection is maintained by checking the inspector's work to determine whether defects reported actually exist as well as whether those existing are reported.

Duplication of masters in the various departments is maintained and gage-checking procedure and frequency established through a gage and measuring system.

All material in production is identified by a heat number so that the entire lot may be recalled in case of hidden defect. New stock is inspected when received, and entered in a quality control chart of suppliers.

These methods of building quality into a product require engineering rather than statistical experts, with ability to secure co-operation from operators and foremen, Mr. Scott pointed out in conclusion.

An instructive film, "Hack Saws and How to Use Them," was shown by a representative of Simonds Saw and Steel Co., Fitchburg, Mass.

Chapter officers for the coming year include Chairman A. A. Nichols, W. H. Nichols & Sons, Waltham; First Vice-Chairman, J. B. Savits, Mgr., Research Dept., and Secretary, F. H. Leonard, Supervisor of Standards, Pneumatic Scale Corp., Ltd., No. Quincy; Second Vice-Chairman J. X. Ryneska, Machine Tool Selection and Procurement, General Electric Co., Lynn; Treas., S. D. Barraclough, Sales Mgr., Arthur A. Crafts Co.

Analyzes Steel Selection

New Haven, Conn. — An unexpected treat—juicy steaks served by George & Harry's Restaurant—surprised the 52 fortunate enough to attend the dinner preceding Chapter 41's January 11th meeting.

Lloyd Raymond, Metallurgist and Manager of Heat Treating, Singer Mfg. Co., Bridgeport, was the technical speaker, covering his subject, "Selection of Steels," in a very comprehensive manner. His discussion included the proper analysis and types of steels for dies, jigs, fixtures, and tools of every description.

The new color film, "An Exact Duplicate," depicting many lesser-known applications of pantograph machines, was shown by Elton Miottel, Customer Research Engineer, George Gorton Machine Co., Racine.

Director Edward J. Berry of Providence briefly outlined some of the Society's national projects.

Officers Elected

Fort Wayne, Ind.—Annual election of Chapter officers featured the dinner meeting which Chapter 56 held at the Chamber of Commerce Bldg., February 14th.

Chosen from the Nominating Committee's slate, the following will be installed at the March meeting: Chairman, Milton H. Kline, Mechanical Equipment Engineer, Broadway Plant, General Electric Co.; First Vice-Chairman, Emil W. Mellin, Chief Tool Designer, International Harvester Co.; Second Vice Chairman, William F. Oswalt, General Supervisor of Planning, Taylor Street Plant, General Electric Co.; Secretary, Edward K. Burt, Sales Engineer, E. A. Kinsey Co., Indianapolis, and Treasurer, John G. Astrom, Supervisor, Engineering, Fries Tool & Machine Works, Inc.

New Officers

Atlanta, Ga.—Election of Chapter officers featured the February 7th dinner meeting held at Ansley Hotel and attended by about ninety members and guests of Chapter 61. Incidental music was rendered by an accordionist.

S. W. Barnett

The voting resulted in the selection of the following officers for 1945-46: Chairman, S. W. Barnett, Group Leader, Production Research; Secretary, George W. Brown, Tool and Die Maker; Treasurer, J. C. Cogburn, Jr., Group Leader, Tool Tryout, all of Bell Aircraft Corporation, Marietta.

C. W. Moore, Manufacturers Representative, was chosen First Vice Chairman, with C. M. Jenkins, Foreman, Metal Shop, Westinghouse Electric & Mfg. Company, as Second Vice Chairman.

Discloses Newly-Developed Materials

South Bend, Ind.—Amazing scientific discoveries resulting in new and improved materials were disclosed by Dr. Hilton Ira Jones, Managing Director, Hizone Laboratories, Willmette, Ill., in his dramatic lecture, "Peeps Of Things To Come," delivered at Chapter 30's Annual Ladies Night, held January 10th at the Oliver Hotel.

Dr. Jones described such interesting new developments as the making of permanent textile dyes from corn cobs, the use of a cellophane ribbon for an inexpensive recording device, many new kinds of glass, including unbreakable types, glass rope practically as strong as steel, and stainproof glass cloth.

He also discussed an all-purpose glue not affected by water or acid, Carvan steel which retains its flexibility at maximum hardness, and many new synthetic rubbers, superior in some respects to the natural product. The speaker used a large display of demonstrating materials to accent his engrossing presentation.

One hundred and forty-seven members and guests were present.

Advances

Baltimore, Md.—Nils H. Lou, formerly Factory Manager, was recently made Assistant to the Vice President, Manufacturing Division, Glenn L. Martin Company.

Nils H. Lou

Three times Chairman of his Chapter, Mr. Lou has also served as Chapter Industrial Relations Chairman and Regional Director.

He is a native of Denmark and studied at Teknisk Skole, Copenhagen.

Traces Thread Grinding Development

Springfield, Ill.—Quite appropriately, the February 6th meeting of the Great Emancipator's hometown Chapter was held at the Abraham Lincoln Hotel.

After dinner, voting for Chapter officers resulted in the election of the following: Chairman, John V. Javorsky, Chief Tool Designer, Allis-Chalmers Mfg. Co.; First Vice Chairman, Harry H. Washbond, Chief Engineer, Baker Mfg. Co.; Second Vice-Chairman, Harry C. Chambers, Assistant Purchasing Agent; Treasurer, William A. Napier, Tool Maker and Designer, Sangamon Electric Co.; Secretary; Lawrence T. Kraus, Assistant Chief Tool Designer, Allis-Chalmers Mfg. Co.

ASTE'er Ernest V. Flanders, Manager, Thread Grinder Dept., Thread Tool Division, Jones & Lamson Machine Co., Springfield, Vt., presented a very interesting lecture tracing the "Modern Development of Thread Grinding" and thread grinding equipment. Slides and films, depicting thread forms and dressers and the training of operators for thread grinding machines, augmented his talk.

Third Michigan Chapter Chartered

Flint, Mich.—Presentation of a Chapter charter to 86 ASTE members in this vicinity crowned the efforts of Michael Skunda, Gage Designer, A. C. Spark Plug Div., G.M.C., in organizing a group of local Tool Engineers.

The charter ceremonies, held February 15th in General Motors Institute Cafeteria, were attended by 129 members and guests, including President D. D. Burnside who conducted the election of officers and delivered the address of the evening.

Executive Secretary Adrian L. Potter greeted the group and read the list of Charter members.

Nominated from the floor for Chapter Chairman, Arthur W. Close, Supervisor of Standards, Chevrolet Motor Div., G.M.C., made a graceful speech of withdrawal in favor of "Mike" Skunda who had prepared the groundwork in organizing the group. Mr. Close was, by vote, permitted to withdraw.

The 61 qualified voters present, approved the following slate of candidates presented by the Nominating Committee: Chairman, Michael Skunda; First Vice-Chairman, Robert G. Freeman, Instructor, Tool Engineering, General Motors Institute; Second Vice-Chairman, George Bennett, Tool Supervisor, Motor Div., Chevrolet-Flint, Div. G.M.C.; Secretary, Harlan T. Pierpont, Abrasive Engineer, Norton Co., Worcester, Mass.; and Treasurer, Archie C. Campbell, Tool Research Engineer, Buick Motor Div., G.M.C.

Chairman Skunda accepted the charter from President Burnside and the ASTE Chairman Pin presented, on behalf of the Society, by Past National Secretary Clyde L. Hause.

Mr. Burnside, Design Engineer, Special Engineering Dept., Republic Aircraft Products Div., Aviation Corp., using as his theme "Production Without Tools," described the experiences of a stove company, not accustomed nor equipped to do accurate work to close tolerances, in converting to war production. As an example, he stated that, in stove manufacturing, 3/8" holes were drilled to take 1/4" bolts.

Using blackboard sketches, he illustrated adaptations of old machinery to jobs for which they were never intended, when it was impossible to purchase new equipment in the early days of the war effort. He also explained how an electro-limit gage had to be built in order to do a specific job. His enthusiastic audience kept him talking for over an hour.

Instructor Lectures On Production Control

Binghamton, N. Y. — Wilbur H. Renner of the International Business Machines School was guest speaker at the February 14th meeting Chapter 35 held at Hotel Sherwood, Greene. Mr. Renner's subject was "Tool and Production Control."

Chapter officers for 1945-46 were also elected.

Surveys Honing Progress

Chicago, Ill. — John W. Kinsey, Field Engineer, Micromatic Hone Corporation, Detroit, spoke on "The Hone Abrading Process in Modern Mass Production" to the approximately 150 members and guests present at Chapter 5's February 5th meeting.

John W. Kinsey

The speaker indicated that hone abrading, developed in Detroit for finishing the bores of 75mm. field gun tubes during World War I, has in recent years become a metal-removing as well as a metal-finishing process. A sound film, supplementing his talk, brought out a number of important facts about honing, illustrating successful applications.

Mr. Kinsey exhibited samples of honed work and answered questions from the floor.

At this meeting, the members elected the following Chapter Officers for the 1945-46 term: Chairman, Frank A. Armstrong, District Mgr., Small Tool and Gage Dept., Pratt & Whitney Div., Niles-Bement-Pond Co.; First Vice Chairman, Clare Bryan, Chief Tool Designer, Link-Belt Ordnance Co.; Second Vice Chairman, Fred J. Schmitt, Sales Mgr., D. A. Stuart Oil Co.; Secretary, Lawrence J. Kollath, Process Engineer, Illinois Div., Bendix Aviation Corp.; Treasurer, Harold M. Taylor, Tool Engineer, Screw Machine Supply Co.

Modern Plant Visited

San Francisco, Calif.—The finest plant tour ever scheduled by Golden Gate Chapter was enjoyed January 9th when members and their guests were taken to Oakland to inspect the modern plant of the Grove Regulator Company. To many it was a real education to see a thoroughly up-to-date plant in operation.

Dinner and a business meeting at the Engineers Club, San Francisco, preceded the trip.

Company Elects Detroiters

Detroit—At the February 5th Annual Meeting of the National Tool Salvage Company, Hiram Ash was re-elected President, Larry W. Lang was advanced from Sales Engineer to Vice President, and Mrs. Harry M. Lewis was re-elected Secretary-Treasurer.

Mr. Ash, one of the founders of the company, is a member of Detroit Chapter as is Mr. Lang who has been a technical speaker at two National conventions and at various Chapter meetings.

The company's present operating personnel pioneered in the process of cutter reconditioning in 1912. The opening of a new department for repairing carbide tipped tools, under the supervision of ASTE'er Ervin Doepker, was recently announced.

THE PX

T 11-3 Bks. 408 L. P.
Service School Comm.
U.S.N.T.S.
Great Lakes, Ill.

Dear Sir:

Thank you very much for your very welcome letter and membership card. It means much to me to be a member of ASTE. I have been a Junior member since 1943 and have received priceless experience from meetings and technical data that were included in my membership. There is great fellowship among the members.

As for post-war plans, I shall certainly be happy to get back to work in the Tool Design field. Then I will be able to put my membership to good use and attend meetings. In the meantime, it will only be a matter of a couple of months until I graduate from Service School. From here I will go out in the Pacific to do my part "with the boys" to lick the Sons of Rising Sun. Thanks for wishing me luck . . . (God only knows whether or not I will need it.)

Sincerely yours,
Roy W. Kinsey, Jr., S 2/c
Chicago Chapter

P.S. The Navy really is "tops" and I am happy to be doing my part in this war in this branch of Service. I am now in the middle of a 16-week course in Torpedo School. Working on "fish" is very interesting.

* * *

Barracks 3
Co. A, Ordnance Officers Candidate School
Aberdeen Proving Grounds, Md.

Gentlemen:

How are things in Detroit anyway? Since I was inducted into the Army six months ago things have moved fast. I received specialized training as a tank mechanic at the Army Service Forces Training Center in Flora, Mississippi. A few weeks ago I was appointed as a candidate for the Ordnance Officers Candidate School. I am now in my second week.

My training at the Detroit Time Study School and at the College of Applied Science had a tremendous bearing on my promotion. The fact that I was a member of ASTE certainly didn't hurt any. I understand the Society is also publishing its magazine. Good for you!

Say hello to all the fellows at Chapter 1-A for me. See you at those monthly meetings — especially since they are now held in the new home. Of course my first attendance will be ? you guess.

Yours truly,
C. J. Krupiarz, 36977108
Detroit Chapter

Photographs Wanted!

Public Relations Chairmen of Chapters — send PHOTOGRAPHS along with Chapter news whenever possible.

Steel Editor Heads Executives Nite Program

Boston, Mass.—At the time of going to press, plans were being completed for Chapter 33's Annual Executives Night, March 8th at Hotel Bradford, with an impressive array of industralists and other executives as guests.

Guy Hubbard

Featured speaker is Guy Hubbard, Machine Tool Editor, *Steel*, whose subject is "Development of Machine Tools in New England." A native Vermonter, from a family with 90 years of machine tool business background, Mr. Hubbard received his education and early industrial experience in New England.

He is the author of several books on machine tools, including one with the same title as his address before the Boston Chapter function.

ASTE'er Ralph E. Flanders, President, Jones & Lamson Machine Co., Springfield, Vt., and Federal Reserve Bank, Boston, serves as Toastmaster.

Among distinguished guests expected are Governor Maurice J. Tobin, Rear Admiral Felix Gygax, Commandant, First Naval District; Fred Blackall, President, New England Council; and E. M. Land, President, Polaroid Co.

Third Vice President W. B. Peirce and Director W. W. Young will represent the Executive Committee and the Board of Director respectively.

Organ music is being furnished by Ralph McElroy.

Honored

Bridgeville, Pa.—In recognition of his outstanding accomplishments while Works Manager of Flannery Bolt Company, W. B. Peirce, Third Vice President of the Society, was recently made Vice President of Research and Development for his company.

Mr. Peirce, in his new capacity, will continue his surveys of the most effective methods of overall production, in addition to developing future products for post-war manufacture, as well as determining a continuity of production operations.

Specialists in deep drilling, the Flannery concern has overcome obstacles encountered elsewhere in the boring of rifle and pistol barrels.

A member of the National Executive Committee and the Organization Progress Committee, Vice President Peirce has also served as National Membership Chairman and Pittsburgh Chapter Chairman.

Another Pittsburgh Chapter member, F. K. Landgraph of the same company, has been advanced from Chief Engineer to Vice President in Charge of Engineering. Mr. Landgraph has been associated with the Flannery concern since 1904.

Training Supervisor Chairman-Elect

Peoria, Ill. — Seventy-three members of Chapter 31 attended a closed meeting at Pere Marquette Hotel, February 6th, for the purpose of choosing officers for the coming year.

Those elected are: Chairman, E. M. Bertschi, Training Supervisor; First Vice-Chairman, W. M. Owen, Asst. Director of Training; Second Vice-Chairman, Everett C. Bowton, Tool Designer; Secretary, C. B. Hartsock, Tool Room; Treasurer, Walter J. Peters, Tool and Die Designer. All of the incoming officers are associated with Caterpillar Tractor Co.

Director Carl A. Holmer, who was present, was called upon to discuss the proposed changes in the Constitution and By-Laws.

Periscope Reviews Service Record

Portsmouth, N. H.—An interview with Reginald E. Goldsmith, Master Machinist and veteran Navy Yard attache, was published in a recent issue of *The Portsmouth Periscope*, Navy Yard organ.

Under the caption, "Meet The People," *The Periscope* reports: "Shake hands with Master Machinist (Inside) Reginald E. Goldsmith, boss of those machinists and helpers in Portsmouth's Shop 31 . . . by the way, one of the more popular Masters in PNY and a gentleman who holds the respect and esteem of his fellow-workers.

R. E. Goldsmith

"Mr. Goldsmith didn't delve into past achievements when interviewed which prompts your editor to add that he may be a good machinist but he's a modest individual when it comes to personal tub-thumping. Ye olde editor spent two days trying to convince him to have his picture taken and another two days trying to jot down his Navy Yard history.

"Actually, Reginald E. Goldsmith ranks with the dwindling band of 40-year employees who are still doing their bit in this all-out second World War.

"He was born in Portsmouth, October 13, 1886, and attended Portsmouth High School. He reported for work at the Navy Yard, June 24, 1902, which means he will wind up 43 years of service next June. In June, 1917, he was appointed leadingman machinist and he has held a supervisory capacity ever since. December, 1940, he was advanced to Chief Quarterman's rating, assuming his present assignment in 1941."

Mr. Goldsmith, an early member of Portland (Me.) Chapter, served as Chairman during the 1943-44 season.

New Manager Expands Offices

Detroit—New quarters to accommodate enlarged engineering offices and a showroom have been provided since Bennett Burgoon, Jr., assumed his duties as District Manager of the local office of Kennametal, Inc.

Bennett Burgoon, Jr.

Facilities for giving private lectures on cutting tool problems are also available at the 5531 Woodward Avenue address.

Mr. Burgoon, who formerly represented his company at Rockford, Illinois, has served his Chapter in that city as Program, Editorial, and Public Relations Chairman. He is now affiliated with Detroit Chapter.

Societies Co-Operate

Rock Island, Ill.—A co-operative program, featuring Magnesium, was staged by the Tri Cities groups of ASME and ASTE February 5th at Fort Armstrong Hotel.

Much interest was shown in the extensive display of magnesium products prepared by Hills-McCanna Co., Chicago; Revere Copper and Brass Co., New York, N. Y.; and Dow Chemical Co., Midland, Mich.

Of especial attraction was a guessing contest for estimating the weights of ingots of cast iron, bronze, aluminum, magnesium, and—an attractive young lady!

Dan W. Moll, Vice President and Treasurer of Hills-McCanna Co., opened the technical session with a talk on "The Past, Present and Future of Magnesium," followed by Alfred B. Two, Technical Advisor, Revere Copper & Brass Co., who explained the "Fabrication, Properties and Uses of Wrought Magnesium Alloys." Concluding the panel discussion, Oscar Blohm, Chief Metallurgist, Hills-McCanna Co., outlined the "Metallurgical Aspects of Magnesium."

Sound films showing the production and fabrication of Magnesium were also screened.

The ASTE'ers held their annual election, choosing the following for the ensuing year: Chairman, A. L. Geiger, Chief Engineer, Voss Brothers Mfg. Co., Davenport, Iowa; First Vice-Chairman, E. A. Titus, Swam Engineering Co., Davenport, Iowa; Second Vice-Chairman, John Speck, Cherry-Burrell Co., Cedar Rapids, Iowa; Secretary, L. N. Dahlen, Asst. Chief Tool Designer, Reynolds Engineering Co.; Treasurer, R. Otto Hines, Moline Tractor Div., Deere & Co., Moline, Ill.

Lakeside Group Snowbound

Erie, Pa.—The heavy New Year's snowstorm, which brought transportation in the community to a standstill, prevented Chapter 62 from holding its meeting scheduled for January 2nd at the General Electric Company Community Center.

This region has been beset with snowdrifts and severe weather all winter.

FILM FLASHES

* *Copper Goes To War*—Recording the vital part copper and its alloys play in the production of "the tools of war," this sound-color film features dramatic sequences in the production and use of Canadian war equipment.

An outline of the peacetime uses of copper and a trip through the vast Anaconda plants, showing the processing of copper and its alloys from casting of raw metal to the finished rolled or drawn product, are also in the 30-minute, 16mm. film, available from Anaconda American Brass, Ltd., New Toronto, Ont., or from American Brass Co., 174 S. Clark, Detroit.

* * *

* *New Horizons In Welding*—Follows, from start to finish, the modern set-up for production welding. Step by step, it traces procedures which permit the fabrication of all-welded equipment on the efficient mass production basis that results in lower costs.

Testing laboratories, template makers, set-up men, weldors, and the time-and-labor-saving devices which have made production welding practicable are all shown in the 30-minute, 16mm. sound film sponsored by Harnischfeger Corporation. Loan requests should be addressed to the company's Welding Division, Milwaukee 14, Wis.

* * *

* *The Formica Story*—The resistance of laminated plastics to heat, cold, moisture, high-frequency currents and corrosion is depicted in a film explaining the manufacture and uses of this material. Shots of test apparatus indicate its properties in terms that will interest the engineer.

Close control methods used in production—the impregnation of paper, cotton, asbestos, glass and wood with thermo-setting resins, and the curing of these laminations into homogeneous sheets, tubes, rods and molded forms are revealed. The working and machining of the material are demonstrated as are the completed end products.

Information concerning the availability of the 45 miuute, 16mm., sound-color film may be secured from The Formica Insulation Company, Cincinnati 32, Ohio.

"Round Rocks"

Portland, Ore.—Methods of prolonging the life of worn and broken tools by grinding were told, and shown in motion pictures, by J. E. Strachan, Jr., at the January 18th meeting Chapter 63 held at Mallory Hotel.

Mr. Strachan, Abrasive Engineer, Norton Co., Worcester, Mass., augmented his presentation, "Round Rocks," with the film, "Grinding Carbide Tools." Assisting him was J. H. Perry, Pulpstone Rep., of the same company, who emphasized the importance of the artificial grinding wheel in replacing the natural grinding stone in the preparation of wood pulp.

Following the technical session, Program Chairman Raymond Neils screened "Backdoor To Japan," "Invasion of Normandy," and a very enjoyable fishing film.

Gear Teeth Design Election Night Topic

Cincinnati, Ohio — Approximate 100 members of Chapter 21 turn out for the February 13th meeting the Engineering Society Headquarters, to elect new officers and to lear from Fred Bohle, Chief Enginee Illinois Tool Works, Chicago, mor about the "Design of Gear Teeth." Mr. Bohle used slides to illustrate hi talk, answering subsequent question from the audience.

Elected to hold office for 1945-46 are: Chairman, C. W. Stricker, Supt., Auto Sun Products; First Vice-Chairman, Lorin Hayden, Supt., Modern Tool & Die Co.; Second Vice-Chairman, H. W. Thomas, Asst. Tool Design Supervisor, Cincinnati Milling Machine Co.; Secretary, Joseph Aprile, Asst. Tool Design Supervisor, Carlton Mach. Tool Co.; and Treasurer, Frank Honekamp, Foreman, R. K. LeBlond Machine Co.

The Annual Dinner Dance, held January 27th at Hotel Alms, was enjoyed by about 300 members and friends.

Powdered Metals Program

Columbus, Ohio—Dinner served by Fort Hayes Hotel to 21 members and guests of Chapter 36 preceded the technical session and annual election of officers held February 14th.

George E. Platzer

George E. Platzer, Chief Engineer, Amplex Division, Chrysler Corp., Detroit, gave another of his timely talks on "Machine Parts From Powdered Metals," which have proved poplar in the Chapters where he has appeared. A number of sample parts were on display for the members' inspection.

Election of Chapter officers resulted in the following: Chairman, Howard Volz, Sales Engineer, Gosiger Machinery Co., Dayton; First Vice-Chairman, W. E. L. Bock, Engineer, Superior Die, Tool & Mach. Co.; Secretary, C. W. Warner, Engineer, Columbus Bolt Works; Treasurer, W. K. Armagost, Tool Designer, Curtiss-Wright Corp.

As an added highlight, ASTE'er J. N. Edmondson, of Ohio State University, reported on the study, being conducted under his direction, by a committee at the University, to determine the desirability and need of establishing a tool engineering course. The Personnel Research Board of the University is co-operating with the ASTE National Education and Training Committee in this project.

Trial questionnaires are being sent to Columbus Chapter officials for their reaction. Final forms will be forwarded to a representative group of the Society's members.

Guests present included Robert Miller, Stevenson-Gordon-Harrison Management Engineers, Cleveland; F. R. Reagon, Edward Ward Steel Co., Cincinnati; and A. F. Bosh, Cincinnati Chapter.

Obituaries

Howard E. Stratton

Death came suddenly to Howard E. Stratton, 51, when he suffered a heart attack January 14 at his home in Elmira.

H. E. Stratton

Mr. Stratton was widely known in the industrial trade and in the Society. For the past four years he has been a partner with Fred W. Gierspeck in the in the Gierston Tool Company, Elmira, which distributes production tools and grinding wheels.

He was earlier associated with R. C. Neal Company, Buffalo; LeValley, McLeod, and Kincaid Company, Elmira; A. V. Wiggins and Company, Syracuse; and the former American-LaFrance Fire Engine Company, Elmira. He was a native of Elmira and saw service in World War I.

Besides acting as Membership Chairman of Elmira Chapter which was organized largely through his efforts, he was affiliated with a number of fraternal groups and service clubs.

* * *

Captain Joseph T. Muller

National Headquarters was recently notified of the death of Captain Joseph T. Muller, 22, killed in action in Italy, December 25, 1943.

An Air Force fighter pilot, Captain Muller had seen considerable overseas action.

The Philadelphia Student member received his technical education at Jourden Technical School and Spring Garden Institute, and was employed at Frankford Arsenal, also of Philadelphia, prior to entering the service in February of 1942.

Lt. Norbert J. Willig

Rochester Chapter has announced the death of Lt. Norbert J. Willig, 25, who was killed in a plane crash in Italy December 23, 1944, after three and a half years' service in the Air Corps.

Lt. N. J. Willig

In civilian life, Lt. Willig was employed at the Camera Works Division, Eastman Kodak Company, Rochester. He attended Mechanics Institute of that city and received his service training at the Army Air Force Technical School, Yale University, New Haven.

* * *

John P. Tierney

Stricken with a heart attack as he was entering his office, John P. Tiernew, 53, founder and President of General Machinery Corporation, Boston, died suddenly January 13th.

A native of Newton, Mass., Mr. Tierney spent his entire life, from the age of 15, in the machine tool sales field, with the exception of a short interlude during World War I when he served in France as First Lieutenant with the Field Artillery.

He was associated with Hill, Clarke & Company, Boston, as Sales Engineer, until the company's dissolution in 1927.

In addition to his affiliation with Boston Chapter, he was an active member of ASME, AMTDA, Boston Chamber of Commerce, Army Ordnance Association, Investors' Fairplay League, New England Railroad Club, and an Honorary Life Member of United States Flag Association. In October of 1943, he was cited by the Army Ordnance Department for distinguished service.

Indianapolis Chapter Executives

Seated, Left to Right: Joseph N. Huser, Chairman; Harry L. Boese, First Vice Chairman; Ronald Gales, 1945 Nominating Committee; George Thomas, Education Chairman; Adelbert W. Putnam, Meetings Chairman; Chester Willoughby, Second Vice-Chairman.
Standing: David R. Smith, Public Relations Chairman; Harry E. McCrady, Entertainment Chairman; George Pyritz, Editorial Chairman; Herman Planker, Picnic and 1945 Nominating Committee; Ralph Morgan, Picnic Committee; Paul L. Cave, Treasurer; Hayden R. Shearer, Constitution and By-Laws Committee; Harry H. Featheringill, Secretary; H. D. ("Pop") Hiatt, Historian; John Horton, Industrial Relations Chairman.

Here are some of the members of Indianapolis Chapter's Executive Committee which held monthly meetings throughout the 1944-45 season, to guide the affairs of the Chapter.

In these meetings, Chapter business was conducted and speakers chosen for the regular monthly meetings. As a result, the technical sessions were full and interesting, and the Chapter attained considerable growth in membership.

Program Committee Surveys Speakers

Milwaukee, Wis.—Under the direction of L. J. Radermacher, National Program Committee Chairman, a list of technical programs, compiled from Chapter reports, has been issued to Chapters for grading, preliminary to a survey of approved speakers.

L. J. Radermacher

In his letter to Chapter Chairmen, Mr. Radermacher explains:

"The National Program Committee has been accumulating data on prospective technical presentations and attempting to secure information on the actual effectiveness and appropriateness of current programs, from the standpoint of the membership of the American Society of Tool Engineers.

"We have compiled a list of speakers and their subjects, many of which have been presented to one or more Chapters. The final measure of their value lies in the manner in which they were received by the membership. Therefore, in making up this list we have provided columns for indicating each speaker's rating. There is also space for comments.

"Please meet with your Program Committee and other Chapter members who may have information or experience in program work. Enter after the name of each speaker known to this group their collective opinion as to his desirability, returning the marked list to the Detroit office, attention of Program Department, for tabulation.

"Information and ratings of other good speakers whom you have heard should be added to this list.

"After compilation of this material, the most popular speakers will be contacted concerning their availability and the physical arrangements necessary for presenting their programs.

"The National Program Committee urges immediate action from your Chapter so that the results of this survey may be issued to incoming Program Chairmen in the form of an up-to-date list of approved speakers."

As incumbent Program Chairmen will, in many cases, advance to the Chapter chairmanship April 1st, it is to their advantage to co-operate in this project to insure sucessful programs throughout their administration.

A similar survey to evaluate motion picture films is contemplated when the current study is completed.

Photographs Wanted!

Public Relations Chairmen of Chapters — send PHOTOGRAPHS along with Chapter news whenever possible.

Annual Election Attracts Many

Los Angeles, Calif. — Dinner at Scully's Cafe for 190 members and guests of Chapter 27 preceded the business of electing officers February 8th.

Those chosen are: Chairman, Arthur D. Lewis, Gen. Mgr., Knu-Vise Products, Inc., Glendale; First Vice-Chairman, Anton Peck, Service & Tool Eng., Jamison Steel Corp.; Second Vice-Chairman, Harold Miller, Tool Designer, Adel Precision Machine Co., Burbank; Secretary, R. Gerald Stronks, Supervisor, Assem. Jig & Fixture Design, North American Aviation Corp., Inglewood; Treasurer, G. J. Walkey, Mfg. & Dev. Dept. Mgr., Lockheed Aircraft Corp., Burbank.

Guest speaker Elton Miottel, Customer Research Engineer, George Gorton Machine Co., Racine, showed a Kodachrome sound film entitled, "An Exact Duplicate," which demonstrated the operation of duplicating machines. Mr. Miottel answered questions after the motion pictures had been run.

Los Angeles Chapter 1945-46 Officers

Left to Right: Treasurer G. J. Walkey, First Vice Chairman Anton Peck, Chairman Arthur Lewis, Second Vice Chairman Harold Miller, and Secretary Gerald Stronks.

Past Chairman Electronics Speaker

Worcester, Mass.—Raymond A. Cole, Experimental Engineer, Norton Co., Machine Division, and Past Chairman of Worcester Chapter, was the featured speaker at a dinner meeting February 6th in Putnam & Thurston's.

Raymond A. Cole

Mr. Cole repeated his address, "Electronic Controls As Applied To Grinding Machines," given before the Annual Meeting at Philadelphia, dealing with the mechanical rather than the electrical aspects of the subject.

Officers elected at this meeting include: Chairman, F. William McQueston, Mechanical Eng., Charles G. Allen Co., Barre; First Vice-Chairman, Harvey M. Allison, Chief Draftsman, John Bath & Co., Inc.; Second Vice-Chairman, Albert T. Warman, General Supt., Worcester Taper Pin Co.; Secretary, Carl D. Schofield, Asst. Supervisor, Norton Co.; Treasurer, Henry Fagerquist, Tool Engineer, Reed-Prentice Corp.

The new color-sound film, "The Formica Story," describing the manufacture and uses of laminated plastics, was shown by Ralph E. Rawlings of Worcester Gear Works, Inc.

Guests among the 110 in attendance included John O. Miller, President and General Mgr., Worcester Gear Works.

Lubricating Problems Simplified

Minneapolis, Minn.—Reduction in the number of lubricants needed for various services was recommended by J. N. Seanor, Alemite Div., Stewart-Warner Corp., in his talk on "Lubricating Systems" January 17 before the 42 members of Twin Cities Chapter who gathered at the Covered Wagon Cafe.

Mr. Seanor pointed out that a forward step had been made in the efficient handling of a difficult problem, with the introduction of Coloroute systems for indicating the proper lubricant and the frequency of application.

Slides, working models, and large cut-away wooden models revealed the development, principles of operation and applications of centralized lubricating systems.

Duplicating Device Described

Providence, R. I.—Description of a pantograph machine whereby forms may be duplicated and reduced in size in relation to a master form featured Elton Miottel's talk on "Exact Duplication" given before Little Rhody Chapter's January 17th meeting at Oates Tavern.

Mr. Miottel, Customer Research Engineer, George Gorton Machine Co., Racine, supplemented his remarks with a color film, "An Exact Duplicate."

There were 33 present for the dinner meeting.

"Honing" Heard

Akron, Ohio—Forty members an guests of Chapter 47 met at Hot Mayflower January 11 to hear Joh W. Kinsey, Field Service Enginee Micromatic Hone Corporation, De troit, speak on "Honing."

Mr. Kinsey reviewed the history o honing, described the various type of machines and operations, particu larly as applied to war production.

Dinner Dance For Ladies

Rochester, N. Y.—Rochester Chap entertained their ladies February 10th in the Powers Hotel Ballroom with their First Annual Ladies Night Dinner Dance.

Beautifully decorated tables, with favors for the guests, were set up around the ballroom. Seated at the head table were: Chairman and Mrs. C. G. Newton, First Vice-Chairman Earle DeBisschop, Second Vice-Chairman and Mrs. Charles Seely, Past Chairman Joseph Schick, Secretary Don Kohler, Mr. and Mrs. Emmett Moore, Mr. and Mrs. Milton Roessel, and Louis Ruda who entertained with a comedy lecture, "Doowidle Whingdingers" in which some of the audience participated.

Dancing was enjoyed by the 174 present.

Hydraulics Heads Program

Boston, Mass.—"Hydraulics in Machine Tool Control and Fixture Operation," presented by Rudolf Esch, Manager, Machine Tool Division, Vickers, Inc., Detroit, featured the January 11th meeting of Chapter 33.

Rudolf Esch

Supplementing his talk with slides, Mr. Esch gave a number of examples where hydraulic applications, using a fluid under pressure and in motion, to transmit power, had clearly demonstrated their superiority over other methods. Various types of valves were shown and their principles explained. The speaker also pointed out applications of the pump as a power generator in such combat equipment as gun turrets, ammunition hoists and boat wrenches.

John Russo of the Lombard-Governor Corporation, Ashland, was introduced as the Gadget Speaker. He demonstrated a device for cleaning the threads on a pump rod in a slush pump in the oil fields. The rod was carburized and hardened, with the thread at the end held to a class 3 fit. This tool produced, in a five minutes, a satisfactory job that originally took one and one quarter hours.

A surprise guest, Milton Kalisher, of Westinghouse Mfg. & Electric Company, put on a House of Magic show that held the audience spellbound. Employing liquid air and a refrigerant gas, he performed many experiments that were both entertaining and instructive.

One Round of Ammunition Now Worth Three in Spring

Detroit—While complimenting industry on its astounding production of war materiel, Brig. Gen. A. B. Quinton, Jr., Detroit Ordnance District Chief, in his address during a recent symphony program broadcast in behalf of war bond sales, stressed the immediate, critical need for ammunition on the fighting front.

Gen. A. B. Quinton, Jr.

In his appeal, Gen. Quinton quoted Chief of Ordnance L. H. Campbell, Jr.'s cabled report, of his inspection tour of European battlefields, that "every round of ammunition supplied now is worth three rounds in the spring."

District Chief Quinton told his listeners: "We are fighting this war on two principal fronts — the fighting front and the production front.

"As Chief of the Detroit Ordnance District, I want to pay tribute to the marvelous production job that has been performed in this area. The team of industry and Government has performed an outstanding service to the nation. American industry, which includes both Management and Labor, has a right to be proud of the terrific impact which our fighting front is able to deliver to the enemy. Every man and every woman who has had a part in this production should know that his efforts have been felt by the enemy. This area, centering about the Arsenal of Democracy, Detroit, has been one of the most vital areas on our war production map. It must continue to play an increasingly important part in war production.

"This talk is timely because it is important for you to realize that our job is not done. Recent events in Europe require that production efforts be redoubled. The Army's needs for certain critical items has never been greater. Further, it is expected that demand for many items of Ordnance will increase this year. In fact, we have been advised that 1945 will be the year of greatest production since the war began.

"Perhaps Germany is beaten and perhaps Japan is beaten, but the United Nations have not yet won. Our servicemen have a big job ahead—they need the fighting tools. While it is true that our men on the fighting fronts have not, until now, been short of ammunition as a result of any production failure, this week we have received several cablegrams from General L. H. Campbell, Jr., Chief of Ordnance, who is on an inspection tour of the battlefields of Europe, stressing the dire need for certain critical items for immediate use against the enemy. This is the first time there has been an official appeal for more material because of actual shortages. We have heard before that our troops were using reserve supplies, but now the situation is even more critical. Let me read to you parts of these messages from General Campbell.

"One says in part, 'Cannot overemphasize urgency for truck parts. Make immediate all-out effort to step up production.'

"A second message—'Critical shortage of all caliber of ammunition exists. Rush increasing quantities to front immediately. Every round delivered now is worth three next spring.'

"Another — 'Tell manufacturers American Army in battle facing critical tire shortages. Immediate increase in production demanded.'

"And, finally, another message: 'Conferences of Army, Corps and Division Commanders emphasize great shortage of artillery and mortars. All-out effort of U.S. industry demanded. Rush artillery and mortars for immediate use against enemy. Our troops are counting on us for instantaneous response to this plea for weapons.'

"While the production job which we have done seems almost incredible, I am calling upon Management and Labor at this time to exercise all-out initiative, courage and fidelity to the job, putting aside personal considerations in order to meet the requirements so eloquently stated in the brevity of the cablegrams which I have just quoted. This is the time when we must improve upon our best.

"Our President has also emphasized this urgency by his 'Work or Fight' order. We must stay on the job.

"Do not try to guess when the war will be over. We must not let the recent Russian successes lull us into a feeling of complacency or false security. For production purposes, the only assumption we can make is that the war will last indefinitely. Let no activity interfere with an all-out production effort. Industry needs over 300,000 workers throughout the country to get our critical procurement up to schedule. We may need more later on.

"Some of you may have felt that the war was about over and have drifted from the home front Army—or, you may not yet be in war production at all. If everyone of you who can do so will decide today to go back to the production front this week, there will be an upsurge of the items needed on the fighting fronts, and General Eisenhower and General MacArthur will feel your support. Do not delay in your decision. As General Campbell has said, 'Every round of ammunition supplied now is worth three rounds in the spring.'

"Perhaps these are grim words to speak to an audience of music lovers. The right and privilege to listen to music such as we are enjoying tonight is one of the things for which we are fighting. In order to guarantee this right and opportunity, not only for ourselves but for the millions of human beings throughout the world, we must give this production job everything we have—give it now, and continue until both Germany and Japan are defeated."

Officer Pinch Hits With Salvage Talk

Richmond, Ind.—When the speaker scheduled for the February 15th meeting found it impossible to be present, Leslie W. Court, Richmond Chapter Membership and Second Vice-Chairman, and Plant Engineer for the local plant of the International Harvester Co., stepped into the gap with an interesting talk on "How We, In Our Plant, Salvaged Old Equipment and Reworked It To Produce Precision Parts." He used blackboard drawings to illustrate his topic, and encouraged the audience to relate special tool problems and solutions.

As an additional feature, "Precisely So," a rather unusual General Motors film, was screened.

Chapter executives elected at this meeting, for the ensuing year are: Chairman, Roland E. Lockridge, Tool Design Squad Leader; First Vice-Chairman, E. H. Granberry, Supervisor of Tool Design Dept., National Automatic Tool Co.; Second Vice-Chairman, Jesse W. Johnson, Materials Engineer; Treasurer, Marvel T. Moore, Supervisor Tool Room Training, Perfect Circle Co.; Secretary, Floyd T. Sykes, Assistant Works Mgr., International Harvester Co.

Attendance at the February meeting was 103, sustaining the fine record made by this new group.

New Junior Activities

Detroit—In response to the needs of younger members for more detailed technical information, Chapter Chairman Grant S. Wilcox has appointed C. Granville Sharpe, Jr., and Donald E. Jahncke, Tool Engineers, Plymouth Div., Chrysler Corp., Co-Chairmen in charge of Junior activities.

As a result of their efforts, the first formal technical session for Juniors was presented January 26, in the Junior Section Room of the Rackham Memorial Building, headquarters of the Engineering Society of Detroit and affiliated groups.

L. B. Bellamy

Chairman Sharpe introduced Standards and Education Chairman Leslie B. Bellamy, Abrasive Engineer, Sterling Grinding Wheel Division, Cleveland Quarries Company, Tiffin, Ohio, who spoke on the "Manufacture, Selection, and Use of Grinding Wheels," summarizing in a very concise manner extensive information not usually divulged in one lecture.

His talk included a discussion of the bond, grain, and hardness of grinding wheels, as well as an explanation of the marking system.

Supplementing the technical talk, W. R. Parsons, Detroit Representative, Norton Company, Worcester, Mass., screened one of his company's film productions demonstrating tool room, off hand, centerless, and cutter grinding, and grinding wheel markings.

The enthusiastic reception accorded this program insures the success of subsequent technical information sessions to be held from time to time to augment regular Chapter activities.

69th Charter Issued

Pontiac, Mich.—Granting a petition from members in Pontiac and the surrounding communities of Birmingham, Royal Oak, Ferndale, Warren and Utica, a Chapter charter was issued March 1st to the approximately 75 ASTE'ers in this vicinity.

Participating in the ceremonies held in the Auditorium of the General Motors Truck and Coach Division were: President, D. D. Burnside; Second Vice President, A. M. Sargent; the Society's first President, J. A. Siegel; Detroit Chapter Chairman, Grant C. Wilcox; Second Vice-Chairman, W. B. McClellan; and A. E. Rylander, Technical Editor of *The Tool Engineer.*

Election of the following officers was conducted by President Burnside: Chairman, C. F. Staples, owner, Staple Eng. Co., Birmingham; First Vice Chairman, Eldon R. Hall, Tool Division Engineer; Secretary, George F. Bryan, Process Engineer, G.M.C., Truck & Coach Division; Second Vice Chairman, Harry Jeremy, Tool Control Supt., Fisher Body; Treasurer, Albert J. Rhodes, Assistant Eng., American Forging & Socket Co.

Presentation of the Chapter charter to Chairman Staples was made by President Burnside, with Second Vice President Sargent bestowing the Society's gift of a ruby-set Chairman pin.

Two excellent new films, "Highway to Alaska," and, "New Horizons in Arc Welding," were screened, following the business session.

Prominent in the organizational work preparatory to establishing Pontiac Chapter were Messrs. Bryan, Hall and Staples, all of whom were honored by election to office.

A committee of nine representatives of local industries appointed September 28th and Chairmanned by Ben J. Hourtienne, Asst. Master Mechanic, Wilson Foundry, has been active in building local membership to its present strength.

Connecticut Firm Changes Hands

Bridgeport, Conn. — Manufacturers of tool holders, lathe and grinder centers, and other fine tools, for the past 30 years, The Ready Tool Company has been sold to the United Tool and Die Corporation of Hartford.

Thomas Fish, President and Manager, will continue with the new company for a limited time as Vice President in charge of sales. Carl B. Christensen, Superintendent, becomes Vice President and Superintendent in charge of manufacture and production.

James J. Carney is President, and Lawrence J. Delaney, Secretary and Treasurer, positions they held with the United Tool and Die Corporation.

Mr. Fish, an ASTE'er since 1938, was instrumental in the organization of Fairfield County Chapter where he has held office as Chairman, Treasurer, and Public Relations Chairman. Mr. Christensen, who has served as Second Vice Chairman and Membership Chairman, is now First Vice Chairman and Program Chairman. Mr. Carney has been a member of Hartford Chapter since 1937.

Vibration Reduced to Displacements of .00000025 Inches

Detroit—Reduction of vibration to displacements of .00000025 inches can be effected through the use of balancing machines according to Werner I. Senger, Manager, Balancing Machine Div., Gisholt Machine Co., Madison, Wis., and technical speaker at the meeting Chapter 1 held February 8th at the Rackham Memorial Bldg.

Mr. Senger, who spoke from an experience of 25 years in the development and application of both static and dynamic balancing machines, illustrated his talk with slides.

A color film, "Tooling For Better Internal Grinding," was presented by Bryant Chucking Grinder Co.

Candidates carrying the election of Chapter officers were: Chairman, Wayne Kay, Field Engineer, Engineering Service, Inc.; First Vice-Chairman, W. B. McClellan, Sales Engineer, Gairing Tool Co.; Second Vice-Chairman, John W. Allmon, Asst. Chief Engineer, Pioneer Eng. & Mfg. Co.; Secretary, Guy L. Carpenter, Owner, Carpenter Engineering Co.; and Treasurer, Andrew Carnegie, Sales Engineer, Crobalt, Inc.

DETROIT CHAPTER 1945-46 *OFFICERS*

Left to Right: Treasurer Andrew Carnegie, Secretary Guy L. Carpenter, Second Vice-Chairman John W. Allmon, First Vice-Chairman W. B. McClellan, Chairman Wayne Kay.

"Members' Night" February Function

Hartford, Conn. — "Members' Night," the annual closed meeting to elect Chapter officers, was held by Chapter 7 February 5th at the City Club.

Approximately 110 were present to participate in the voting which resulted as follows: Chairman, George A. Highberg, Vice Pres. and Factory Mgr., The Cushman Chuck Co.; First Vice Chairman, Edmond Morancey, Tool Engineer, Pratt & Whitney Aircraft Co.; Second Vice Chairman, Richard A. Smith, Chief Tool Eng., Machine Dept., Pratt & Whitney Div., Niles-Bement-Pond Co.; Secretary, Melville L. Merrill, Owner, Melville L. Merrill Co.; Treasurer, William F. Jarvis, Supt. The C. L. Jarvis Co., Middletown.

Chairman Highberg has announced, as appointees to committee chairmanships: Constitution and By-Laws, Arthur A. Merry, Chief Tool Engineer; Program, Edmond Morancey, Tool Engineer, Pratt & Whitney Div., United Aircraft Corp., East Hartford; Editorial, David Carpenter, Tool Engineer, Hamilton Standard Propellers Div., United Aircraft Corp., East Hartford; Membership, Clayton S. Parsons, District Mgr., J. K. Smit & Sons, Inc., West Hartford; Industrial Relations, Kenneth F. Thomas, District Field Engineer, S.K.F. Industries, Inc.; Public Relations, Stanley G. Johnson, Partner, Johnson Gage Co., Bloomfield, Conn.; Education and Training, Robert F. Edmunds, Pres. and Gen. Mgr., The Farmington Engineering Co., West Hartford; Standards, Joseph Balciunas, Engineer, Skinner Chuck Co., New Britain; Entertainment, Albert E. Englund, Factory Mgr., Jacobs Mfg. Co., Elmwood.

First Technical Speaker Fills Return Engagement

St. Louis, Mo.—With the return appearance of the first technical speaker to address Chapter 17 and the election of a charter member to the office of Chapter Chairman, the Annual Meeting held February 1st at Hotel Melbourne was like "old home week."

Those receiving the majority of votes cast for each office are: Chairman, Willis G. Ehrhardt, President, Ehrhardt Tool and Machine Co.; First Vice-Chairman, J. J. Demuth, Second Vice-Chairman, Ralph H. Roth, Works Manager, Busch-Sulzer Bros.-Diesel Engine Co.; Secretary, Robert W. Boehlow, Design Engineer, Carter Carburetor Corp.; Treasurer, T. C. Stephens, Vice President, Robert R. Stephens Mach'y Co., Inc.

E. A. Doogan, the first Chapter Chairman, introduced Herman Goldberg, Research Engineer, R. G. Haskins Co., Chicago, recalling the Chapter's initial technical session addressed by the same speaker.

Mr. Goldberg, a thorough master of his subject, presented one of his outstanding programs on "Taps, Tapping, Hi-Speed Drilling, Quick Acting Fixtures For Tapping and Drilling, and Fixture Design."

Actual equipment was set up for demonstrating high speed drilling and tapping and the use of quick acting fixtures for handling parts.

Industrial Oils Topics

Fort William, Ont.—"Topics Connected With Oils In Industry" were discussed by J. W. Leach, Industrial Engineer, Manitoba Div., Imperial Oil Co., Ltd., when he appeared before Lakehead Chapter, January 11th.

The dinner meeting was held at the Royal Edward Hotel.

BOOK BRIEFS

Cast Metals Handbook—The authoritative reference book on the engineering properties of cast metals, prepared through the activities of a committee sponsored jointly by the American Foundrymen's Association and several affiliated organizations, recently appeared in a third, revised edition.

Several hundred practical men of industry compiled the vast amount of data which is invaluable to those who design metal parts or who purchase cast metals for industrial products.

Of especial interest to all mechanical, product and designing engineers is the section devoted to the Significance of Strength and Ductility Tests. Engineer—Designers will find the Recommendations to Designs of Castings very helpful. Purchasing agents should study the Recommendations to Buyers of Castings.

Other sections deal with Cast Steel, Malleable Iron, Cast Iron, and Non-Ferrous Alloys. Illustrated charts of graphite flake sizes and types are also included.

An extensive cross-index and comprehensive bibliographies enhance the book's value.

The 745-page, cloth-bound volume, containing 258 illustrations and 204 tables, is available to non-members of the American Foundrymen's Association at a cost of $6.00. Orders should be addressed to the Association's offices at 222 W. Adams St., Chicago 6, Ill.

* * *

High-Frequency Induction Heating—Frank W. Curtis. Written by a specialist in the field, this book gives a clear and thorough understanding of the practical techniques of this streamlined method of heating metals.

It explains the fundamental electrical principles involved, defines the range and scope, describes construction design of induction-heating coils, discusses in detail many applications of induction heating to specific heating problems, anticipates the marked effect that this heating technique will have on manufacturing methods and on future constructional design.

Contents include Principles of Induction Heating, Types of Induction-Heating Equipment, Design of Induction Heating Coils; Brazing, Soldering, and Joining; Hardening and Heat-Treating, Fixtures for Induction Heating, Miscellaneous Induction-Heating Applications, Designing for Induction Heating, and Dialectric Heating.

Size 5¼" x 8¼", with 249 illustrations, the 255-page book is listed at $2.75 by the McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 18.

* * *

Precision Measurement in the Metal Working Industry, Volume II—With the twofold purpose of meeting the need for knowledge of the great advances in the practice of precision measurement and of supplying information on the latest types of such measuring instruments and machines, the International Business Machines Department of Education has prepared entirely new text for the present edition of this book.

Profusely illustrated with photographs, drawings and charts, the 290-page, cloth-bound volume includes chapters covering Surface Plates and Accessories, Angle Measuring Instruments, Comparators, Optical Measuring Instruments, Measuring Machines, Surface and Sub-Surface Inspection, and Hardness Testing.

Further information is available from the publishers, Syracuse University Press, 900 University Building, Syracuse 2, N.Y.

* * *

The Veteran's Guide—In response to requests from many industrial relations executives faced with the problem of answering questions asked by returning servicemen, a 48-page, pocket-size booklet has been prepared.

The specific information concerning loans, pensions, education, tax relief, and re-employment benefits available to veterans, and addresses of agencies to contact makes this a handy reference work.

Priced on a sliding scale of from $1.00 per single copy to $1000 for lots of 10,000, the publication may be distributed by employers, at small cost. Published by Prentice-Hall, Inc., 70 Fifth Avenue, New York 11.

Entertains With "Wit and Humor"

Kansas City, Mo.—Thomas Collins, Public Relations Representative of the City National Bank, tickled the risibilities of his audience when he spoke on "Wit and Humor" at the January 17th meeting of Chapter 57. Mr. Collins handled his subject in a thoroughly enjoyable manner.

A Dutch lunch was served by the Pickwick Hotel to the 41 members and visitors present.

Welding Talk Follows Election

Hamilton, Ont.—Seventy members of Chapter 42 met February 9 at Royal Connaught Hotel to elect Chapter officers for the coming year.

The successful candidates are: Chairman, Harry H. Whitehall, Owner and Manager, Whitehall Tool & Engineering Co.; First Vice Chairman, John N. Walton, Manager, Hamilton District, Atlas Steels Ltd.; Second Vice Chairman, William A. Alexander, Supt., Kraft Containers Ltd.; Secretary, John E. Ball, Tool Engineer, Otis-Fensom Elevator Co.; Treasurer, Robert Young, Supervisor, Machine Shop, Westdale Technical School.

L. T. Gottschalk, Jr., Welding Application Engineer, Westinghouse Electric & Mfg Co., Pittsburgh, Pa., spoke on "Electronic Control in Resistance Welding," convincing his listeners that the possibilities of welding, with electronically-controlled machines, have scarcely been touched.

Among the guests present were Director W. A. Dawson, and William F. Faulds of Toronto, formerly of Hamilton.

Talks on "Tomorrow"

Houston, Texas—The Tool Engineer's responsibility in creating postwar jobs was outlined by Frank A. Watts, General Sales Mgr., Humble Oil & Refining Co., in his address, "Tomorrow," given before Chapter 29 at the Texas State Hotel, January 16th.

Coffee speaker was Dr. W. W. Kemmerer, Assistant to the President, University of Houston, who discussed "Our American Way of Life."

A sound film, "Birth of the B-29," was also screened.

Chapter Activities in This Issue

IS YOUR CHAPTER REPRESENTED?

GOOD READING

A Guide to Articles of Interest and Significance in the Trade Press

Burrs and Burring. John E. Huyler in January *Mill & Factory*. Burring, which is one of the headaches of industry, is intelligently discussed in a very comprehensive article.

Military Training Techniques Suggest New Ideas for Industry. Benjamin W. Corrado in January 5th *American Machinist*. In view of the number of inquiries coming into the A.S.T.E. offices, from servicemen, for information on field service operations, this article should prove of great interest even to the men in the armed forces from whom the author had inspiration for the story. It also provokes thought on civilian adaption of these techniques of the battle field to postwar production.

Strengthening Congress. An editorial, February 5th *Steel*. A comment on the Robert Heller report, titled as above, which made 14 concrete recommendations on committees in both houses of Congress.

Heat Treatment of Aircraft Parts. Gerald Eldredge Stedmann in February *Modern Machine Shop*. An outline of the equipment and processes used in the heat treat department of North American Aviation, Inc., Kansas City Plant.

Not Yet the Millenium. Howard Campbell in February *Modern Machine Shop*. A thought provoking comment on the Annual Wage Plan.

Universal Cutter and Tool Grinding. An operator's instruction manual, issued by Covell Manufacturing Company, Benton Harbor, Michigan, that may well be included in the Tool Engineer's library. Profusely illustrated, it is replete with information on the selection of grinding wheels and on set-ups for cutter grinding. In addition, the book contains valuable tables and engineering data. Book C, $1.00.

How to Run a Lathe. *South Bend Lathe Works'* popular book on the care and operation of a lathe. Now in its 43rd edition, the book has been revised and supplemented with additional, instructive text and illustrations. Price 25c.

Quality Control. A new pocket size handbook on scientific inspection, issued by Continental Machines, Inc., 1301 Washington Avenue South, Minneapolis 4, Minnesota, makers of DoAll gages and gage instruments.

This handbook gives concise information on scientific inspection through controls by means of precision measuring instruments. 200 photographs, in addition to charts, diagrams and tables make a highly interesting and informative book. Of particular interest are the many conversion tables and measuring data.

The book, which is in its 2nd edition, is dedicated to Eli Whitney, credited as the father of American Mass Production. The scientific data and illustrations used have been compiled by the engineering and research staffs of Continental Machines of Minneapolis, Savage Tool Company of Savage, Minnesota, DoAll Company of Des Plaines, Illinois, and Metron Instrument Company of Denver, Colorado. For copies, write Continental Machines at address above.

Handbook of Precision Instruments. A handbook, called Jansson Catalog No. 31, published by Jansson Gage Company, 19208 Glendale Avenue, Detroit. In addition to describing Jansson precision gages, the booklet contains interesting sidelights on precision measurement and illustrative set-ups.

Hydraulics. Vickers, Inc., Bulletin #43-11, describing Vickers variable delivery piston type pumps in capacities from 3 to 340 GPM, and continuous duty up to 2000 PSI and intermittent up to 3000 PSI. Replete with illustrations and pertinent engineering data. Application for copies, by qualified engineering executives, may be made to the manufacturer at 1400 Oakman Boulevard, Detroit 32, Mchigan.

The Tool and Die Industry Comes of Age. A survey published jointly by the National Tool and Die Manufacturers Association of Cleveland and the Chicago Tool and Die Institute. The authors are William R. White, Jr., vice president in charge of production at Midwestern Tool Company, Chicago, and Stuart H. Sinclair, sales manager of the Federal Tool Corporation, Chicago.

Written essentially for the Tool and Die Industry, it provides the background material and statistics necessary for a thorough analysis of operations and recommendations dealing with postwar problems. It is also of vital interest to all contract shop owners and executives. Recommending co-operation rather than intensive competition, the study is well considered and includes consideration of the "Financial Condition of the Industry," "Peculiarities of the Industry" and "Postwar Outlook."

Copies may be had or purchased by writing George S. Eaton, Executive Secretary, National Tool & Die Manufacturers Association, 1413 Union Commerce Bldg., Cleveland 14, Ohio.

Weddell Tools, Incorporated, Rochester 7, N.Y., has issued a new bulletin on Tri-Bit Cutters with adjustable blades, also, on Fly Cutters, boring bars, hollow mills and expansion reamers, as well as tool holders for Tri-Bits.

Other bulletins cover Tri-Bit carbide tipped Hyper Mills, and flywheel arbors. The latter are designed to impart momentum to the cutters and, coincidentally, to reduce vibration. Bulletins may be had on request by writing the manufacturer.

Drills: Whitman & Barnes, 2108 W. Fort Street, Detroit 16, has issued a new circular which illustrates and lists Hercules Precision Drills and Watchmakers (flat) Drills. Both types are furnished in S.S. and oversize shanks, with diameters regularly made and carried in stock ranging from .15 to 1.00 M/M (.0059″ to .0394″).

The drills are made from high speed steel, on a production basis and to extremely close limits. However, special diameters, and special designs, can be furnished to customers' specifications. All operations are controlled by specially designed optical and mechanical equipment.

Powder Metallurgy. Keystone Carbon Company, Inc., St. Marys, Pennsylvania, has a very comprehensive bulletin—practically a catalog—on powdered metal parts and, in section 2, on powdered metal bearings. In addition to listing sizes of plain and spherical (self-aligning) bearings, it is replete with engineering data and useful information. Available on request.

Directory of A.S.T.E. Chapter Officers

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Geo[illegible] Wilcox, Jr., Chairman
[illegible]apleton Road
[illegible] Pte. Farms 30, Mich.
Joh[illegible] Allmon, Secretary

RACIN[illegible] CHAPTER NO. 2
[illegible] Jones, Chairman
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W. Warren Cady, Secretary

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